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A Miscellany of Railroad Jobs

By L. C. Morrow

Managing Editor, *American Machinist*

Opportunities for economy offered by some of the simplest locomotive parts — Examples of efficient home-made machines—Making use of air in clamping devices

NOT ALL of the jobs in a railroad repair shop are as simple as they look, and some of the most ordinary offer opportunities for refinement which, if taken advantage of, pay many times over for any special tools and equipment required. Here are some of the everyday jobs of the railroad shop as handled by the West Albany shops of the New York Central.

Three operations in the application of tires to wheel centers are illustrated in Figs. 1, 2 and 3. The tires are heated in the 72-in. oil-fired covered furnace shown in Fig. 1. While the tires are heating, the wheel centers and axle are placed on V-supports that are part of the tire-mounting machine shown in Fig. 2. In using this machine, great care is exercised in locating and clamping the first wheel center and in mounting its tire. When that part of the operation is done properly, it is necessary, in mounting the second tire, only to place it on the wheel center and pull it up until the two tires fit the tread clamps.

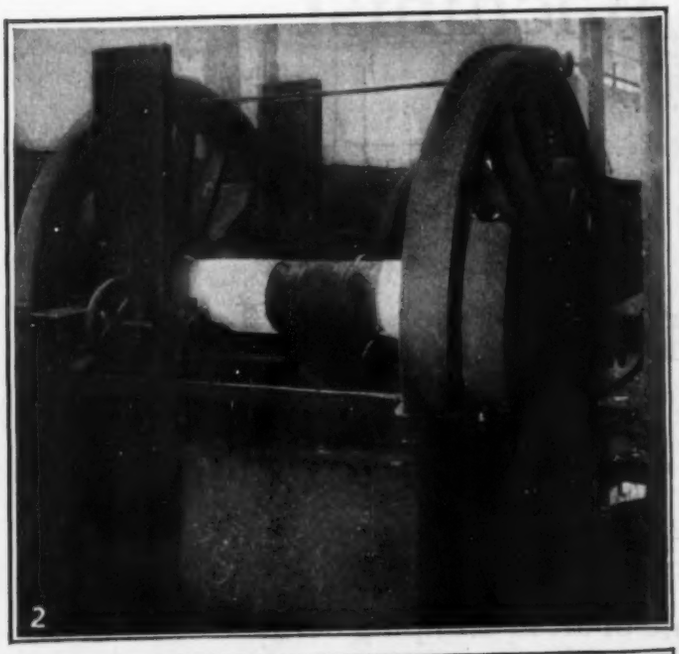
Fig. 1—72-in. oil-fired, covered furnace for heating tires

The two uprights, bolted to the base of the machine, are straight edges, and it is against them that the tire of the first wheel center is pulled. Inasmuch as the tire overlaps the wheel center, on the inner side, the wheel center, in being clamped in the machine, is pulled up against four blocks that are supported on the uprights, but which extend the proper distance beyond them. One of the wheel-center clamps is shown in the illustration just inside of the front upright. When the hot tire is slipped onto the wheel center, it is tapped back until seated, and then pulled against the uprights by a second set of clamps, one of which is shown in front of the front upright. The three tread clamps used in the application of the second tire can be seen in the illustration. After the tires are in position the retaining rings are bolted on.

The interesting feature of the turning operation shown in Fig. 3 is the concentricity gage mounted on the caliper bar and shown in detail in Fig. 4. This gage is used to check the concentricity of the journals. It is of the multiplying-lever type and the segment is graduated to show thousandths of an inch.

Piston rings for steam cylinders are slit at an angle on the home-made machine illustrated in Fig. 5, which consists of a vise mounted on a slide traversed by a lever, and a cold saw operated through a worm and worm gear by a motor. The apparatus is inexpensive and the results all that could be desired.

When metal is welded to the jaws of a frame, it becomes necessary to remachine the jaw to obtain a smooth, plain surface, and the West Albany shops have designed the thoroughly satisfactory electric grinder shown in Fig. 6. The method of clamping the grinder to the frame is clearly shown. The feed is by screw, operated by means of the handwheel at the bottom of the machine. The head carrying the wheel is mounted on a cross-slide so that the wheel can be fed across the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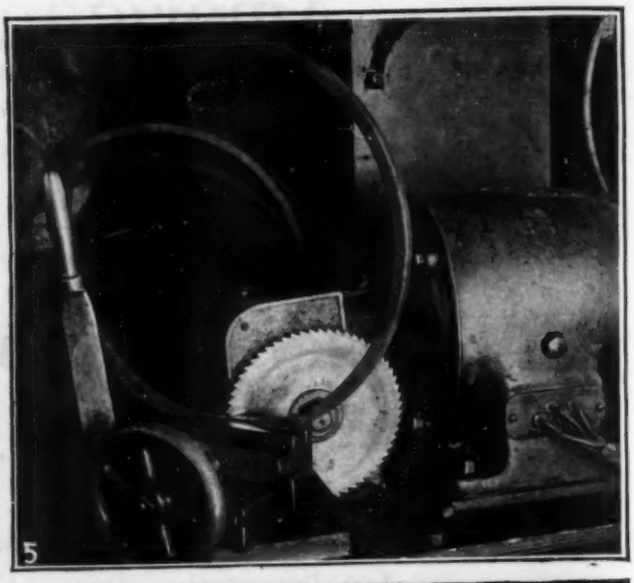
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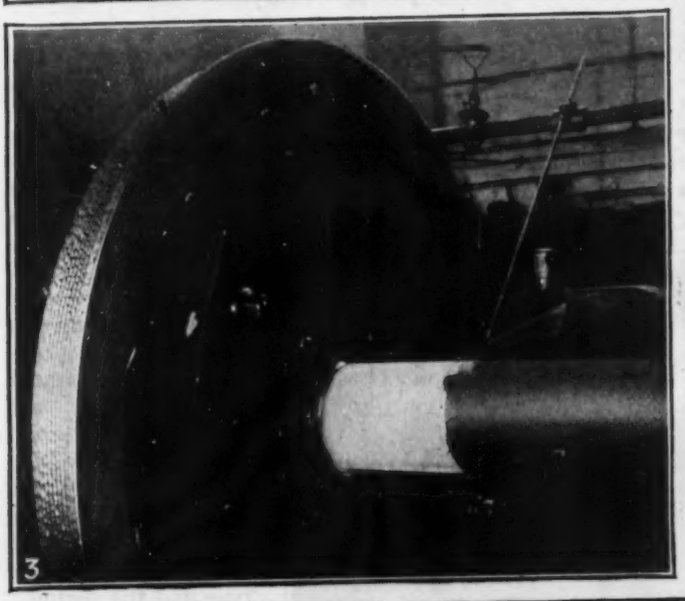
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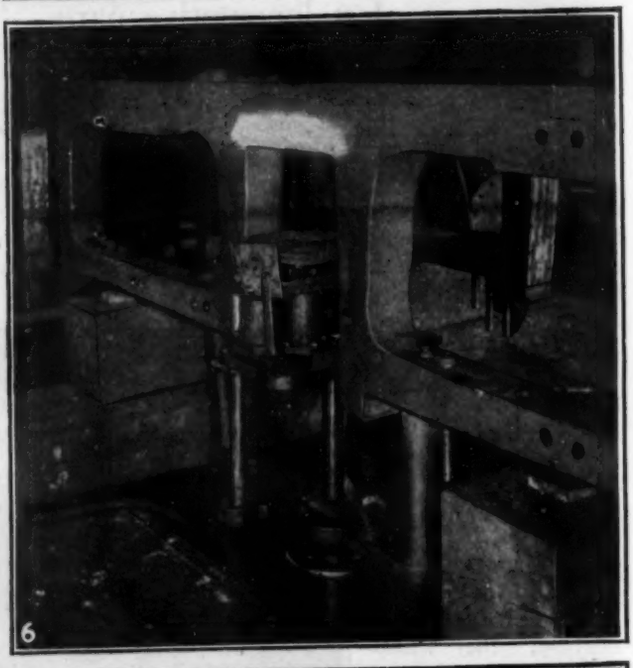
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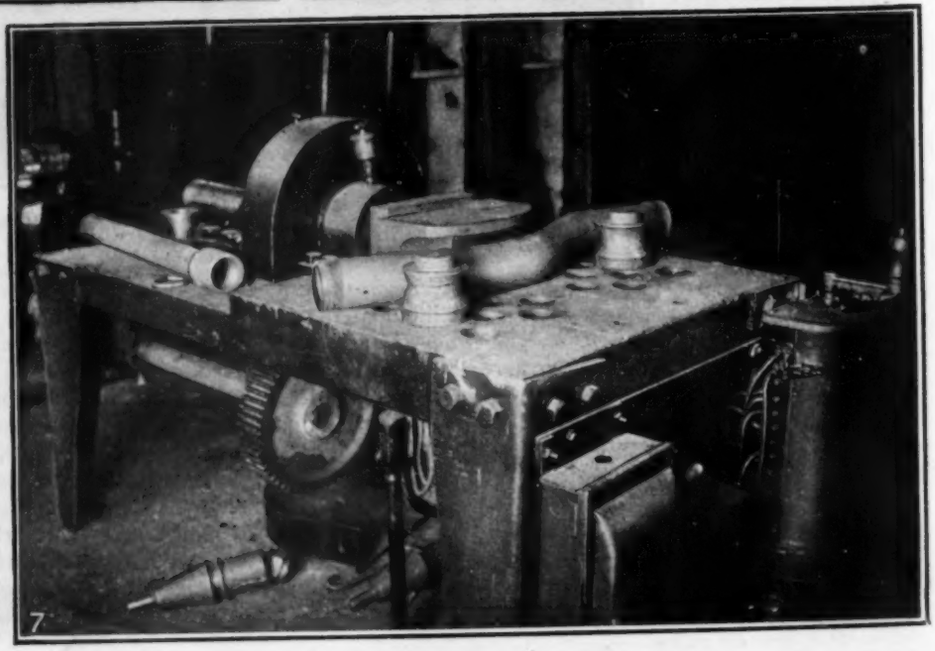
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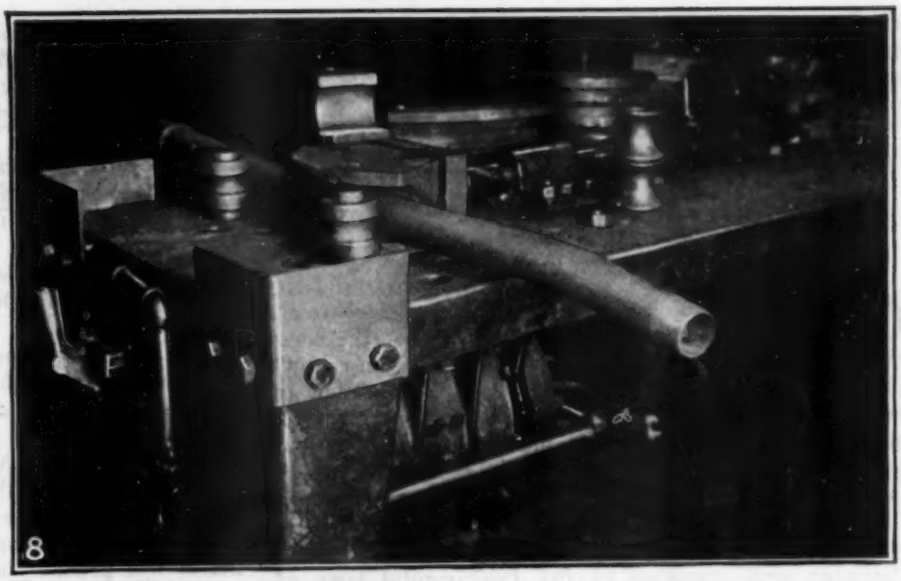
Fig. 2—Tire-mounting machine

Fig. 3—Gage to check concentricity of journal. See Fig. 4

Fig. 4—Concentricity gage of multiplying-lever type shown mounted on caliper bar in Fig. 3



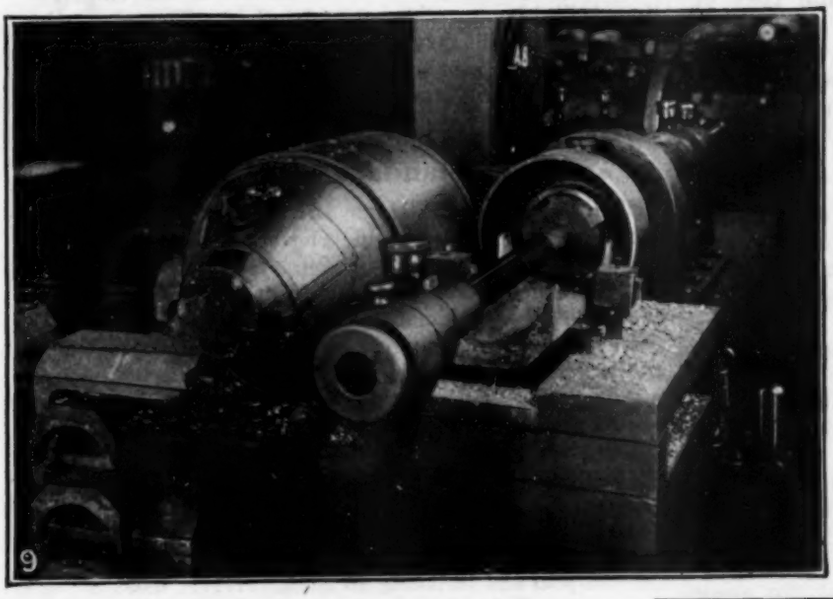


Fig. 5—Machine for slitting piston rings for steam cylinders

Fig. 6—Portable electric jaw-grinder

Fig. 7—Motor-driven pipe-bending machine

Fig. 8—Air-operated pipe-bending machine

Fig. 9—Machine for boring the babbitted brasses for engine and tender trucks

Fig. 10—Building up rod ends by welding

work. The operator stands in the pit.

Two pipe-bending machines are shown in Figs. 7 and 8, one motor-driven and the other operated by air. Some of the forms are shown. It has been found that, with the combinations of positions made possible by the holes in the tables, comparatively few forms are needed, the quantity depending chiefly upon the sizes of pipe to be bent.

A special, home-made machine for boring the babbitted brasses for engine and tender trucks is illustrated in Fig. 9. The box is supported on two blocks against which it is held by two air-operated jams. The 4-tool cutter is caused to travel along the shaft by a crank, operated by the electric motor through suitable gearing. The cut is taken back and forth. After the return cut, the cutter-traverse drive is automatically tripped.

Welding plays an important part in railroad repair work and it is well to include an example among references to miscellaneous operations. The job pictured in Fig. 10 is that of building up rod ends. It is only one of many kinds of work found for the welding process.

There are more spectacular kinds of work than the miscellaneous jobs in railroad shops, but the examples

cited seem to indicate that the simple part, constantly going through the shop, invites the wide-awake shop official to exercise his inventive ability in the interests of economy.

The "All-Round" Mechanic—Discussion

By Harry Senior

ON PAGE 935, Vol. 60, of the *American Machinist*, readers are asked for their definitions of the commonly used but often misapplied term "all-round" mechanic; a definition that is by no means easy to render and one that is more than likely to vary in accordance with the location, method of training and length of service of the person who renders it. Here is mine:

An all-round mechanic is a *machinist* whose experience with and knowledge of machinery is based upon a thorough understanding of the fundamental laws of mechanics.

Men and methods change; natural laws do not. Though the branches of the trade are now many and diversified, they all involve the same principles and are governed by the same laws as was the trade of our fathers and grandfathers before us. New *adaptations* of mechanical principles are being made every day, but no new *principles* have been invented since Adam was a boy. The man who knows these principles and knows how to apply them to accomplish his ends is an "all-round" mechanic—even though he may be functioning as a bank president.

The boy who learned his trade a hundred years ago would, if he could be reincarnated, be much surprised by the complexity of modern mechanisms, but he would not be bewildered thereby. He would know that the a-b-c of his trade, thoroughly instilled into him during the course of his long and arduous training, would serve as well to interpret the mysteries of modern machines as of the crude implements with which his own apprenticeship was associated.

He would not be satisfied to be told that "to move lever *A* to the left and give the handwheel *B* a full turn to the right, would cause the toolpoint *C* to move 0.41144 in. in the direction of the arrow"; he would want to know why it did so, and how. He would also (most likely) want to know whether or not his instructor knew what he was talking about—and if given half an opportunity he would find out.

Modern conditions, and particularly modern methods of training, are not favorable to the production of all-round mechanics. Boys, and teachers as well, are bewildered by the maze of mechanical applications with which they are confronted, and tackle the subject from the top. They study the machines as a whole rather than the underlying principles upon which they work. Teachers, if they be production foremen, are too much interested in the work and too little interested in the particular boy who does it. Vocational and training schools do not as a rule devote sufficient time to insure a thorough understanding of each subject.

We used to think, not so long ago, that seven years was none too long a period in which to teach a boy the machine trade. Later, we concluded that four years, or even three, were sufficient. I have been told by the chief instructor of a well-known institution for mechanical training that he could teach a boy more in six weeks than the boy would learn in the shop in four years. The period first mentioned may have been too long—it depends a great deal upon the boy. The last is an obvious absurdity.

A boy learns only by experience. Teach him theory and give him no opportunity to put theory to the test of practice, though at the end of his period he may be letter perfect he no more understands his subject than a well-trained parrot understands English. A boy may be *taught* all that he ought to know in six weeks, but to make sure that he has *learned* it, it is necessary to give him time to demonstrate each principle to his own satisfaction—and that may take seven years.

An old foreman of my acquaintance who has trained many boys, once said to me: "Don't expect a boy to know anything until he has done it at least once—and don't be too *darned* sure of it then."

A machinist who knows *how* without knowing *why* may become a very proficient and rapid workman within definite and perhaps narrow limits, and within those limits will probably be more valuable to his employer than will his more versatile brother. The man who knows *why* will very soon find out *how* (if he does not already know), and he has no limitations. He is the "all-round" mechanic.

S. A. E. Standard for Wire Mesh

The Parts and Fittings Division of the S. A. E. Standards Committee has developed a standard for wire mesh, or cloth, for oil, gasoline or water strainers, based on the desires of users and the ability of manufacturers to supply material direct from stock. Twenty meshes are given, ranging from 8 to 200 as shown in the accompanying table. The mesh is the number of openings per lineal inch and the weave is plain except for 80 and finer, which can be "twilled" or crimped but must give square openings. An accuracy of spacing wires is demanded which gives within 10 per cent, plus or minus, of the openings specified. The tolerances for the wire diameter are as follows:

	Inch
Up to and including 16 mesh	0.003
From 20 to 50 mesh	0.002
From 60 to 100 mesh	0.0015
Above 100 mesh	0.001

The material shall be specified by the purchaser, taking account of the fact that at present manufacturers of wire-cloth stock these meshes in steel and brass up to about 80 mesh; above this it is common practice to supply phosphor-bronze and monel-metal.

The accompanying table is particularly useful owing to the last column which gives the proportion of openings to total area. Designers must, however, bear in mind the question of friction in the flow of liquids through small openings, in planning sufficient areas for the passage of the desired amount of liquid.

S. A. E. STANDARD FOR WIRE-CLOTH

Mesh	Diameter of Wire, In.	Size of Opening In.	Proportion of Openings to Total Area, Per Cent[1]	Mesh	Diameter of Wire, In.	Size of Opening, In.	Proportion of Openings to Total Area, Per Cent[1]
8	0.028	0.097	60	45	0.0095	0.0130	34
10	0.025	0.075	56	50	0.009	0.0110	30
12	0.023	0.060	52	60	0.008	0.0090	29
14	0.020	0.051	51	70	0.007	0.0073	26
16	0.018	0.044	51	80	0.006	0.0068	29
20	0.016	0.034	46	90	0.005	0.0059	28
24	0.015	0.027	42	100	0.0045	0.0055	30
30	0.013	0.021	40	120	0.004	0.0043	26
35	0.011	0.018	40	150	0.003	0.0037	31
40	0.010	0.015	36	200	0.0021	0.0029	33

[1] This column is given for general information only.

Machine Tools at the British Empire Exhibition

By I. William Chubb
Editor, European Edition, *American Machinist*

Very few machine tools exhibited — Those shown are mostly used for demonstration purposes—Precision tools and measuring machines are in evidence at several stands

MACHINE tools are shown only on two or three stands at the Wembley Exhibition, and then but as parts of a large exhibit. The newest machines perhaps are on the stand of Armstrong, Whitworth & Co., Ltd., who display a lathe, Fig. 12, to turn pairs of railway, wagon and carriage wheels up to 4 ft. in diameter, either new or after service. One headstock can be moved along the bed by screw and gearing, an auxiliary 5-hp. motor being provided. The main drive is by a 30-hp. motor. Sliding spindles are provided, which can be forced forward by handwheel and screw, the front end of the spindle being enlarged and coned to take outside journals and provided with split cone grips for the journals. By means of a slipping clutch the spindle sleeves can be moved on to the cone bushes on the axle by motor, the handwheels being used for extra tightening only. The drive is by hooks for spoke wheels and push drivers for solid wheels, and it is possible to bore a wheel on one head and a tire on the other or two tires. Two channel irons form adjustable inclined planes, by which the axles can be rolled into place, avoiding the use of cranes.

Another lathe, Fig. 13, on the same stand is for carriage and wagon axles. The middle portion of the axle is left black from the forging and the two ends are turned simultaneously. The lathe has a central drive by means of double-helical gears, and a special driver is employed, an annular plate through which the axle can pass being hung on links from the faceplate while a second pair of links hold the loose driving plate to the carrier. The latter is secured to the axle by set screws, and compensating links allow for the irregular sections of the forged axles concerned. The driving plate is retained in normal position by spring cushions when there is no work in the lathe. The purpose of the driver is to eliminate jarring. A total time of 37 min. is allowed for finishing an axle of 40 tons weight, the forgings, $\frac{1}{2}$ in. large in diameter, having previously been ended and centered in another machine. The time allows 3 min. for finishing axle in lathe, with 2 min. for removal, 10$\frac{1}{2}$ min. for roughing down to $\frac{1}{32}$ in. over finished size in one cut, 6$\frac{1}{2}$ min. for forming collar, journal, etc., leaving the journal 0.002 in. full in diam., 5 min. for finish-turning the wheel seat and 10 min. for rolling the journal and radii.

An automatic screw machine, Fig. 14, will take $\frac{7}{8}$-in. stock, turning a maximum length of 3 in. A six-hole turret is provided and twelve spindle speeds are available, two being selected automatically for turning and threading. The feeding-out, withdrawing and turret-revolving operations are at constant speed, not affected by changes of spindle speed or feed. A planetary two-speed gear provides a constant fast speed for performing the idle operations and a slow speed, variable by means of change wheels, for turning feeds.

For demonstration purposes, a number of other ma-

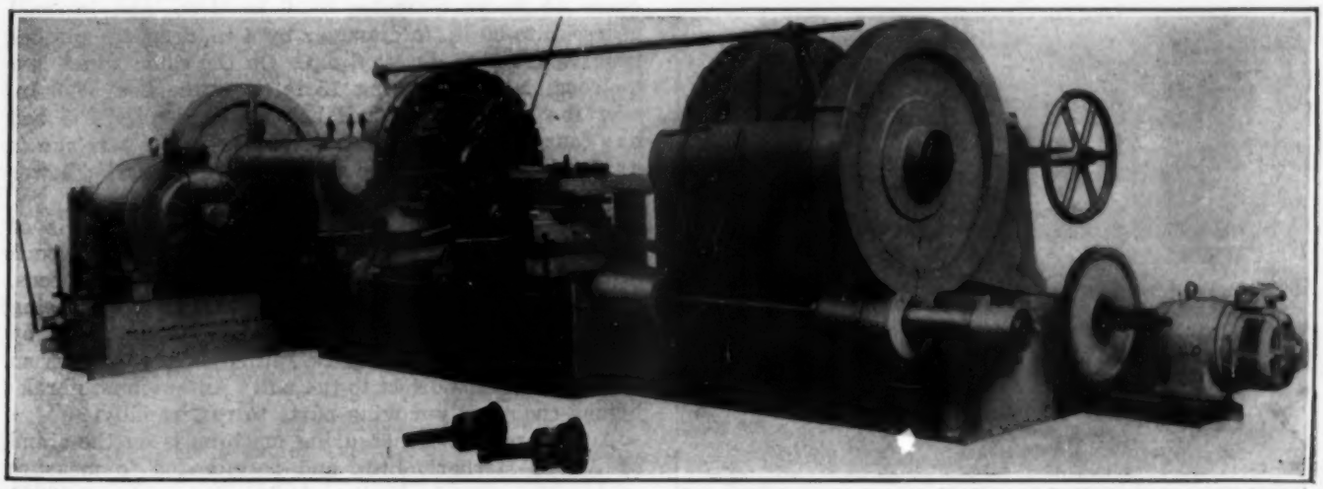


Fig. 12—Armstrong-Whitworth wheel lathe

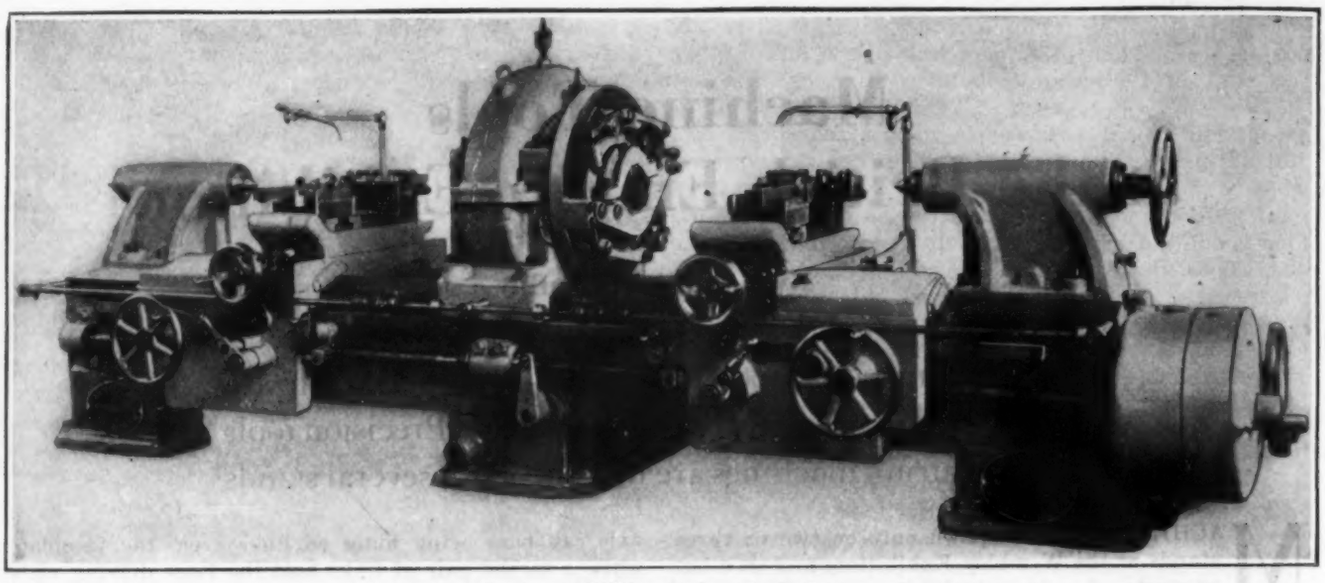


Fig. 13—Armstrong-Whitworth axle lathe

chine tools are included. They have been practically withdrawn from production in the shops of the Armstrong-Whitworth firm and are used to demonstrate the cutting capacities of drills and cutters. For instance, a ¾-in. 14 per cent tungsten twist drill is run at 350 r.p.m. and will drill carbon steel flats ⅜ in. thick, having a tensile strength of 37 tons to the sq.in., with a penetration rate of 4.6 in. a min., 800 holes being drilled on the average between successive grindings.

Formed cutters, made of the same steel, are shown in a pair, which is one of a set of four gangs put into operation in May last. They milled about 12,900 pieces of carbon steel of the tenacity mentioned above. The peripheral speed exceeds 60 ft. per min., the feed being 4 in. per min., nearly 70 cu.in. of material being removed per hour. Hacksaw blades of 14-per cent tungsten steel have the teeth ground on the cutting faces after hardening. They operate on the carbon steel mentioned, the machine making 100 strokes per min., the saw when new cutting through ten pieces with a total cross section of 2⅜ in. by 2⅜ in. in 8 min. After twelve hours, when the cutting time has been increased to 12 min., the saw is re-ground and the cutting time returns to the original eight-minute rate. The blades can be re-ground four or five times.

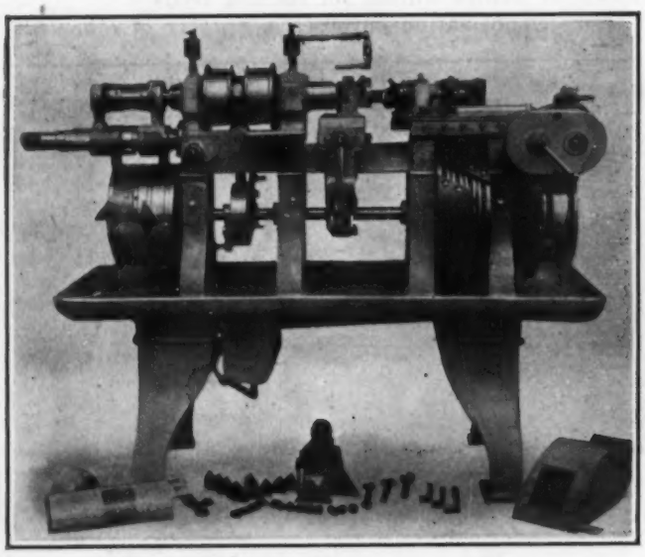


Fig. 14—"Smallpiece" screw machine

A gear-cutting hob ground to form after hardening is shown. It is of spindle type, having four starts, 1.375-in. pitch, finished within limits of 0.0002 in. per inch of pitch length. Besides a workshop measuring machine employing the gravity feel principle between plane surfaces, the firm shows the first measuring machine made by Joseph Whitworth in the year 1833, the measuring screw being cut 16 threads to the inch, with a micrometer wheel marked with 256 divisions. With the firm's measuring machine exhibited, the average mechanic can repeat measurements to within 0.00002 in., while with vernier scale the machine will read 0.00001 in. The millionth measuring machine on loan from South Kensington Museum, may also be seen, and hexagon surface plates prepared in accordance with the Whitworth method as first published in 1840.

Gear-Cutting and Broaching Machines

While a few other machine tools may be seen, it is perhaps only necessary to mention here a Fellows-type gear machine shown by Vickers, Ltd., to cut external gears 44 in. in diameter by 6 in. deep, and internal gears up to 50 in. in diameter by 4 in. deep, the pitches ranging from 48 d.p. to 3 d.p. On the same stand is a toolroom lathe, swinging 15 in. over the bed or 8 in. over the carriage, the bed being 6 ft. long. The bed has four rails throughout its length. The carriage is guided by two upper vee slides and two inverted lower guides.

The Vickers broaching machine on exhibition is of screw type, with a working stroke of 54 in., to broach square holes up to 3¼ in. on a side. Two cutting speeds, 3 ft. and 6 ft. per min., are provided, the return being at 35 ft. per min. The cutting speed is controlled by sliding gears, and the quick return is obtained from pulleys connected direct to the nut. An automatic brake brings the quickly-moving parts to rest rapidly.

A universal gage-measuring machine is on the stand of Alfred Herbert, Ltd., and is intended to measure within its scope to limits of plus and minus 0.00001 in., and be quite independent of the personal element.

The measurements are directly compared with end standards having an accuracy guaranteed within 5 parts in a million but usually within 1 in a million. The magnification of the micrometer dial is 1,000 to 1, a vernier giving readings correct to 0.00001 in. The multiplying mechanism is both mechanical and optical, with ratios respectively of 60 and 70 to 1, making a total of 4,200 to 1, with the consequence that a variation on the work of 0.00001 in. gives a movement of the indicator shadow of rather more than 0.04 in. The maximum length measured is 12 in., the maximum external diameter between centers 6 in., and internal diameter 5 in., the threaded work taken being 6 in. diameter up to 4 in. pitch external and 5 in. in diameter up to 4 in. pitch internal. On the same stand is the Lucigraph, a machine of the photostat type now being made by the firm to produce prints up to 18 in. by 24 in. in surface.

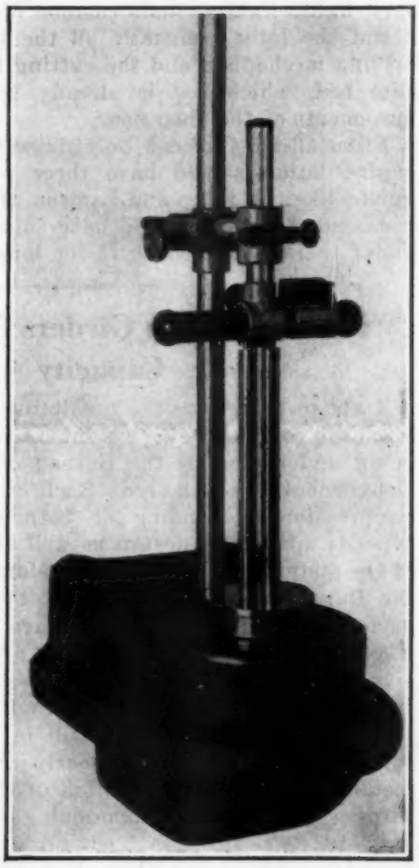


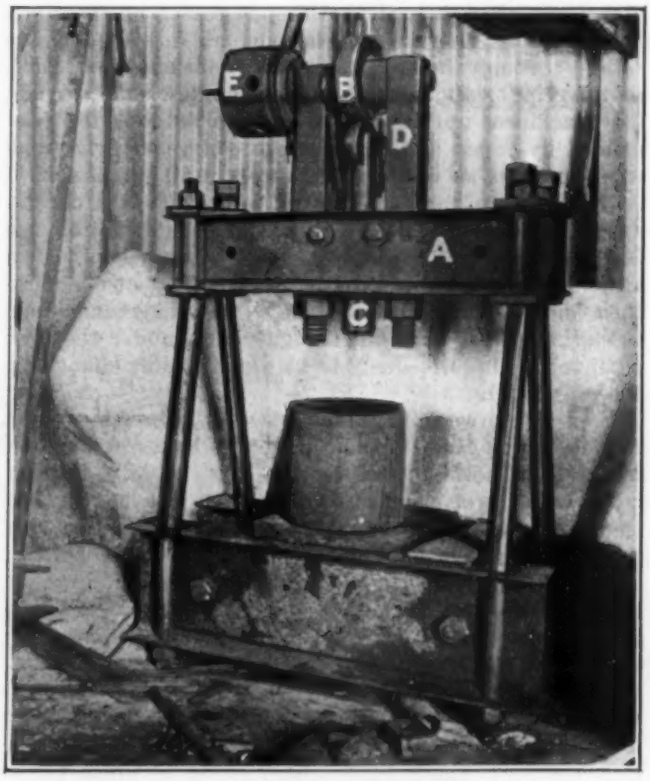
Fig. 15—Pitter length generator comparator

Finally, a short reference may be made to the generator comparator, Fig. 15, which is on the stand of the Pitter Guage and Precision Tool Co., Ltd., Woolwich, together with standard reference bars, slip gages of the well-known type, etc. By means of the generator comparator and a parent bar, end-measuring bars, etc., of other sizes can be determined. All bars 1 in. or more in length have only the ends hardened, the depth being 0.15 in. The instrument is self-calibrating and self-adjusting. For comparison purposes, it is claimed, the accuracy lies within 0.000001 in. The wall pattern appliance shown has a leveling base carrying a rotating platen. A vertical parallel cylindrical bar is fixed at the lower end of the base and at the upper end by a bracket, not illustrated. It carries a spirit level, above which are cross-slides for exploring the top surfaces of gages, etc., which stand on the rotating platen. The end bars are placed side by side on the platen (as shown) and their heights are compared by the spirit level which is then carried on two ball points, the level being the indicator of the machine. Simultaneous side-by-side comparison avoids the necessity of working to standard temperature, and as the platen can be rotated, the level can be used in a differential manner, doubling its magnification, and avoiding the need for previous calibration of the run of the bubble when only equality of length is to be determined. The indicator is mounted so as to be independent of distortion in the machine itself, and when making comparisons, it simply rests on top of the pieces to be compared. The level is calibrated and a special scale is provided which will read direct in hundred-thousandths of an inch. For reading the position of the bubble the mirror is set at 45 deg. and silvered all over except at two narrow horizontal bands. When viewed in a horizontal direction the scale behind it is visible through the two clear bands of glass and the bubble is seen by reflection on either side of and between the views of the scale. Parallax between the scale divisions and the bubble is avoided.

Cam Operated Arbor Press

By Charles F. Henry

An arbor press of unusual design is shown herewith. It was designed and built in the shop of Hazen Machine Co., Sarasota, Fla. The bed or upper frame is of I-beams, *A*, tied together so as to present a solid surface for the uprights which carry the cam *B*. The flanges are bored for the plunger *C*, which carries a roller at its upper end as a contact for the cam surface. The uprights *D* are square bars with the lower ends turned round and threaded to receive the nuts which hold them in place in the I-beams.



A cam driven arbor press

As shown, the cam is actuated by a bar in the turret head *E*. When completed, however, the cam will be power driven through gearing so that the plunger will be moved regularly and the work will be placed beneath it on the up stroke. The plunger is returned by coil springs on each side at present.

The lower frame also is of I-beams, and the legs are made up of bolts running through pipes as shown. The machine is an unusual one to be found in a small shop.

Where Does the Foundation End and the Machine Begin?

By Entropy

A DESIGNER of planers finds himself in a quandary because his short machines can be practically self-contained, but the same machine with a table twenty feet long has to depend on its foundation for its alignment.

Probably Professor Sweet would have answered the question by saying that any machine that can be designed to stand on three legs is its own foundation, but that all others needed foundations and are not complete without them.

In spite of all that has been said about three point support, the principle is not extensively used. There seems to be practical objection in some cases, and in others merely habits of thought, that make it hard to change designs. The result is that many machines can be and are used without separate foundations in one shop, and in another are provided with substantial concrete bases.

If a machine can be supported on three points, and its own members are sufficiently heavy to absorb its own vibrations, then little if anything is gained by spending money for anything more than enough to keep it from falling through the floor. Most pedestal machines come in this class. Shapers, milling machines, small grinding machines, upright drills—such tools could be suspended by ropes and given a self-contained drive and would operate as well as on a substantial foundation.

On the other hand the lightest lathe, one that can be used in any loft or attic, will be sprung perceptibly by the movements of the floor. Try such a machine for alignment with a heavy casting on the floor at one side, then move the casting to the other side; and even though the floor may be strong enough under the city ordinances, there is likely to be a perceptible change in the alignment.

If a lathe were a three-legged object, this would not be true. Habit makes us build lathes with four legs. I do not know if anyone ever actually built a lathe with three. Jones and Lamson use a rear leg that is pivoted in place, so that it looks like two legs but only functions as one. Whether any lathe builder does it or not I do not know. If anyone does, I would like to know how he manages when a customer wants a bed long enough to require a center leg. Year by year we see a little increase in the weight of lathe beds, but it is unlikely that they can ever be made stiff enough so that the machine will depend on whatever is under the legs as a foundation. Fortunately nineteen lathes out of twenty do not have to do accurate work. Turning between centers is either on such short pieces that errors do not show, or on long work the errors become so much less than those introduced by center and follow rests that they do not affect the quality of the work. Grinding machines are seldom made long enough to be carried on three points. Fortunately they were not put on the market until the three-point principle was established, so when a long machine is called for, a substantial foundation is always provided.

The two machines most likely to give trouble are the lathe and the planer, and possibly the planer types of milling machines. The planer is more easy to design than the lathe, because all the real stresses are compactly brought together in the middle of the machine. From the cutting tool to the driving shaft is only a short distance. The stresses go through the cross-rail, the uprights or housings and the central portion of the bed. There is nothing in the way of making all these parts as heavy as the pocket book will allow. The end parts of the bed perform no function except to carry the table. None of the stresses set up by the cutting action affect these end parts. But if they are warped by the settling of a floor they twist the table and the work which is on it, and cause poor work. Since they cannot be made stiff enough to overcome this possibility, it is necessary that they be carried on a substantial foundation, and then they may be made very light, lighter than custom dictates.

But the lathe transmits all the torque between the driving mechanism and the cutting tool through a long slim bed, which bed is already trying to resist the movements of the shop floor.

From all this we can only draw the conclusion that engine lathes should have three point supports, disguised like the Jones and Lamson, if you like, for short beds and that they should have substantial foundations under their whole length if for long work.

Testing Airship Girders for Carrying Capacity

Tests to determine the possibility of getting greater strength for the same weight in airship girders are being undertaken by the Bureau of Standards, of the Department of Commerce. Such girders carry loads in compression or bending or both and their strength depends upon their design as well as upon the strength of the material. In the best duralumin girders of today the Bureau of Standards finds it possible to apply a load of only 20,000 lb. per square inch of the metal, whereas the metal itself will not yield under compressive stresses of over 30,000 lb. per square inch. It is thought that better design, resulting in making all parts equally strong, may result in the strength of the girder approaching more nearly the strength of the metal. The correct calculation of the strength of such girders is considered impossible, and it will be necessary to make girders and girder parts of various promising designs and test them for strength.

More Efficient Locomotives

(From Research Narratives No. 82, published by Engineering Foundation.)

Every one thinks he knows all about the steam locomotive, because it has been with us so long, but today we have a new steam locomotive. This statement is proved by the epoch-making records of the Altoona test plant of the Pennsylvania Railroad. The new complete power plant on wheels and rails produces power at the rate of one indicated horsepower for the consumption of 1.79 pounds of coal, with even higher efficiency to come. Records as low as 13.5 pounds of steam per indicated horsepower-hour put the steam locomotive in the class of efficient non-condensing power plants.

Few persons know that locomotives have been built and are in service with power enough and flexibility enough to enable them to haul 10,000 tons at 18 miles an hour on level track on the one hand and to haul trains of 4,500 tons with ten minutes' clearance ahead of a passenger train which is scheduled at 49 miles per hour for 90 miles without a stop, on the other hand.

Progress Toward 1,000-Hp. Aircraft Engines

By Glenn D. Angle
Engineering Division, Air Service, U. S. Army

A review of the development of the large, light, internal-combustion engine—Satisfactory performance of an engine designed by the Air Service at McCook Field

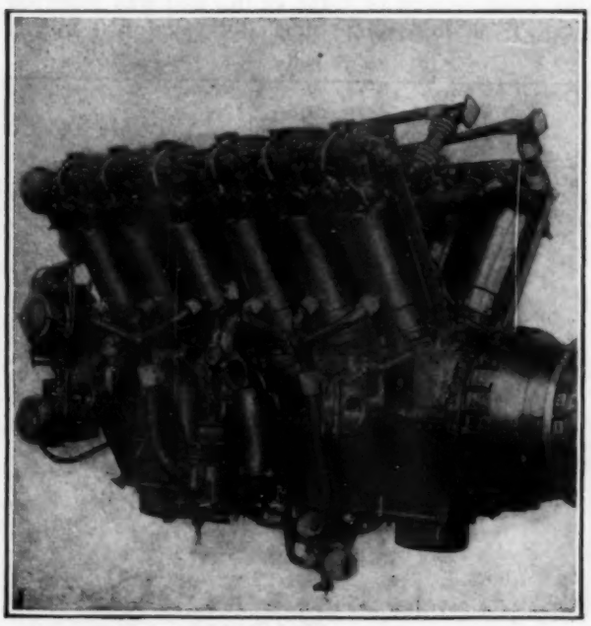
THE effectiveness of any military airplane used for bombing operations can be measured by its useful load. Beside the crew and its equipment, useful loading consists of bombs and fuel in proportions determined by the radius and nature of the operations. The amount of useful load at any given air speed depends upon the available horsepower in excess of that necessary to lift the airplane itself, hence the term of effectiveness can be reduced to available horsepower, and we can understand the military necessity of increasing the power output. Bombing airplanes, with a few simple alterations can be converted into passenger and freight carrying ships, so that developments along this line are also important as steps toward commercial air travel.

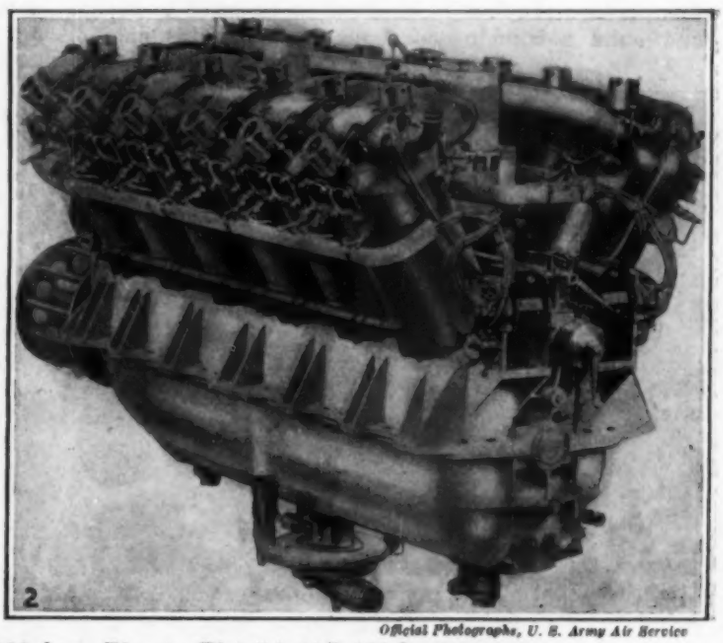
The single engine is known to have certain advantages over multi-engined installations delivering the same horsepower. Perhaps the most important is the reduction of parasite resistance. The large engine, installed as a tractor requires little or no increase in the usual dimensions required for the fuselage, while nacelles containing the engines of an interplane installation add directly to the resistance.

Separate controls are required to each engine, therefore the duties of the pilot become more difficult as we increase the number of engines. Remote controls to engines in the wings are not easy to adjust nor to maintain in satisfactory operating condition. No multi-engined installation can be built as light as one with a single engine of the same power. A single, large-engine unit can be made heavier per unit of power output, thereby increasing its reliability, so that the airplane with this engine need weigh no more than one with two or more exceptionally light power plants.

Differences in opinion on the single, versus the multi-engine installation are based almost entirely on the question of reliability. The large engine can be made more reliable without increasing its total weight and it has been proved that a bi-motored airplane cannot fly satisfactorily with only one engine functioning. Therefore, we must conclude that we have no greater reliability with a mult-engine installation on the supposition of engine failure, unless three or more equally reliable engines are employed.

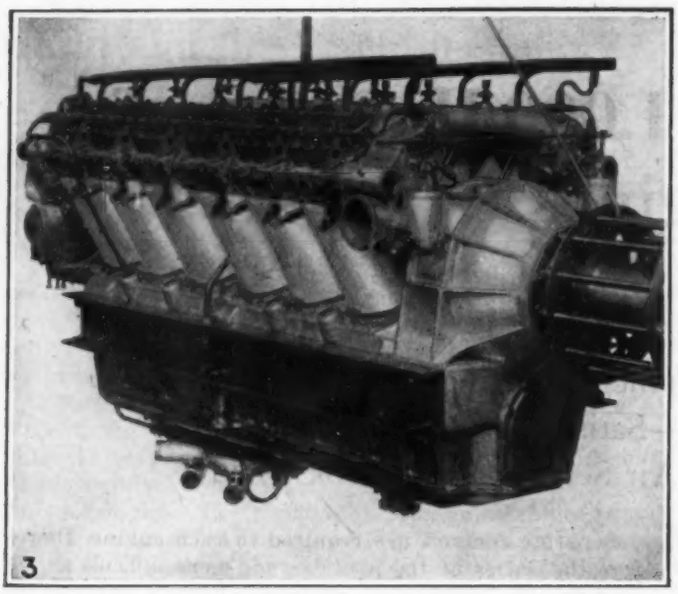
Apparently the development of large power units for both military and commercial aircraft is justified, and

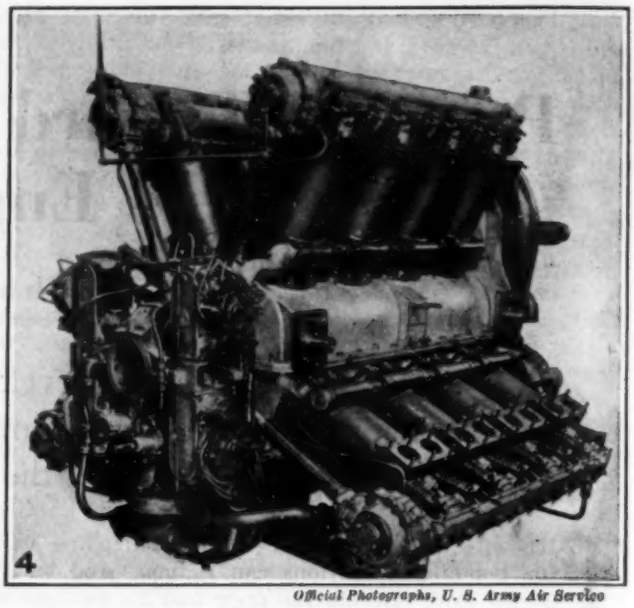




Official Photographs, U. S. Army Air Service

Fig. 1—Rolls-Royce "Condor," 600-680 hp. Fig. 2—Fiat "A-14," 650 horsepower





Official Photographs, U. S. Army Air Service

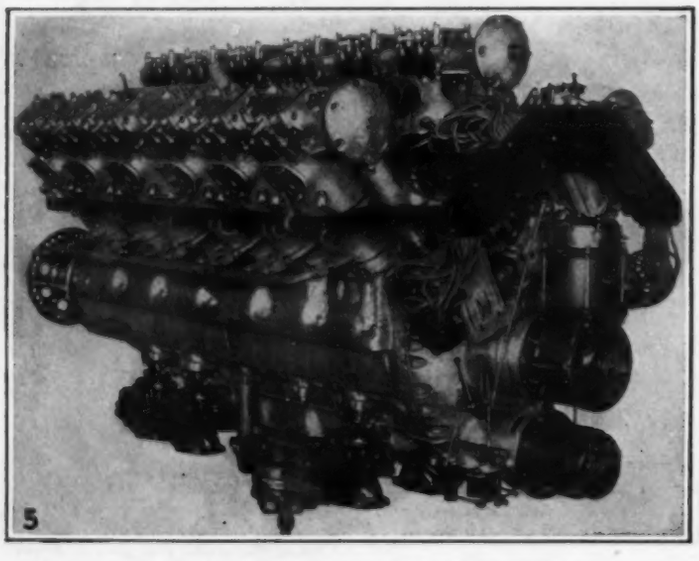
Fig. 3—Sunbeam "Sikh," 850 hp. Fig. 4—Napier "Cub," 1,000 horsepower

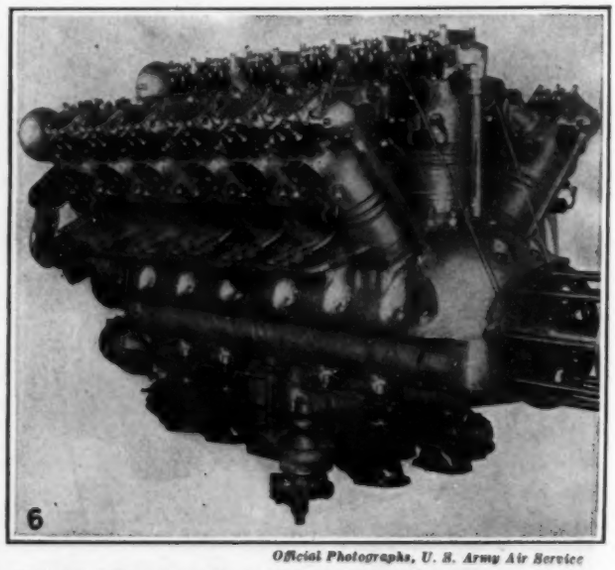
it is interesting to note what has been done by the U. S. Army Air Service. Numerous reports from abroad tell of European development of large engines for bombing planes, but very little information has been circulated concerning similar developments here. Our Air Service has, however, been actively engaged in the development of large engines ever since the year following the armistice. That worthwhile results have been obtained, can be seen from the following brief comments on the various engines of 600 hp. or more that have been designed and constructed.

Only thirteen airplane engines, rated at 600 hp. or over, have actually been designed and built. Seven were of French design, three were British, two American, and one Italian. Apparently only six of these engines have been developed to any great degree—three British, one French, one Italian, and one American.

Rolls-Royce, the well known British manufacturer, was perhaps the first in England to be asked to design and build a bombing airplane engine. This engine, the "Condor," Fig. 1, would no doubt have been produced in quantities except for the termination of hostilities. The Rolls-Royce engine is a 12-cylinder, V-type of approximately 2,138-cu.in. piston displacement. The propeller is driven through reduction gears, and the dry weight is reported to be 1,336 lb. Originally rated 600 hp. at normal speed, the latest reports show that 650 hp. can be developed at 1,900 r.p.m. At this rating, a weight-figure of 2.06 lb. per hp. is obtained. Continued development of this engine has brought it to a point of refinement equal to any other of its class in Europe.

Previous to the completion of the first Condor, about June, 1917, the Fiat A-14 engine made its appearance in Italy. This engine, Fig. 2, was also a 12-cylinder, V-type, but had provision for mounting the propeller directly upon the crankshaft instead of driving through reducing gears. It was larger than the Condor, having a piston displacement of 3,488 cu.in., and was reported to weigh 1,740 lb. While normally rated 650 hp. at





Official Photographs, U. S. Army Air Service

Fig. 5—Air Service "W-1A," 700-750 horsepower. Fig. 6—The ignition end of the "W-1A"

1,550 r.p.m., or 2.68 lb. per hp., it is reported to actually deliver over 700 hp. at its normal speed. Although rather bulky and heavy for the power delivered, and not well suited for the requirements, nevertheless, it was the first engine of its size ever flown. More hours have probably been flown with the A-14 than any other engine of over 600 horsepower.

The largest program of bombing-engine development was conducted in France. Altogether six types were represented. The Renault and Peugeot establishments confined their efforts to the 12-cylinder V-forms with direct-driven propellers. Both engines were expected to delived 600 hp., although the former was rated at 500 hp. The Renault had 3,359-cu.in. piston displacement and was reported to deliver 600 hp. at 1,650 r.p.m. This engine weighed 1,168 lb. or 2.33 lb. per hp. at normal rating, and 1.95 lb. per hp. at the greater output. The piston displacement of the Peugeot L-41 engine was 2,502 cu.in., and its normal speed, 1,600 r.p.m. The reported weight—1,270 lb.—gives a value of 2.11 lb. per hp. Very little is known of the merits and serviceability of either of these engines.

An experimental 8-cylinder, V-type engine of 2,612-cu.in. piston displacement was built by LeMaitre and Gerard. This engine was rated 700 hp. at 1,600 r.p.m., and was reported to weigh 1,260 lb., or 1.8 lb. per rated hp. There are reasons for doubting the success of this engine since no reports have been received recently regarding further development.

The pioneer radial-engine builder, Anzani, designed and constructed a 20-cylinder, water-cooled, radial engine of 2,818-cu.in. piston displacement, rated at 600 hp. This engine was said to develop 650 hp. at 1,700 r.p.m., and 700 hp. at maximum speed. The objection common to all radial engines applies to this design; namely, that head resistance is too great in proportion to the power delivered.

16-Cylinder Panhard

The Panhard-Levassor Automobile Works of Paris constructed a 16-cylinder engine of the double V-type, which has four rows of four cylinders each, with an included angle of 45 deg. between adjacent rows. This engine has a piston displacement of 2,740 cu.in., and is reported to develop 650 hp. at 1,600 r.p.m. and 700 hp. at 1,700 r.p.m. It is said to weigh 1,433 lb. or 2.05 lb. per maximum hp. Considerable trouble was experienced during the preliminary tests of this engine and it may have been abandoned.

The largest engine ever designed in France is the Lorraine-Dietrich 24-cylinder W-type, in three rows of 8 cylinders, with the two outer rows at 60 deg. to the center, vertical row. The piston displacement is 3,649 cu.in. and the output estimated 1,000 hp. at 1,600 r.p.m. The weight is optimistically estimated at 1,870 lb., or 1.87 lb. per hp. The design of this engine was begun prior to the armistice, but it is doubtful if the engine was ever constructed. A wooden model was exhibited at the International Exhibition in Paris, during December, 1919, it being in reality a double form of the Lorraine-Dietrich, 12-cylinder, W-type rated at 500 hp.

The Farman 18-cylinder, W-type engine of 600 hp. is evidently the only one of the large French designs receiving much attention at present. According to reports it weighs 2,080 lb., or 3.46 lb. per hp. It is interesting to note that out of seven designs, the one showing the greatest weight per horsepower should survive. The Farman engine was designed after the war and more closely meets the requirements in engines of its class. It has a reducing gear of different ratios for the propeller.

Two other British firms have designed and built engines of large output. The Sunbeam Company has a 12-cylinder, V-type engine known as the "Sikh," Fig. 3, with a piston displacement of 4,033 cu.in., the largest on record. It is rated 850 hp. at 1,400 r.p.m., and has a reduction gear giving a normal speed of 920 r.p.m. to the propeller. The weight is reported to be 1,952 lb. or 2.3 lb. per hp. This engine is intended for lighter-than-air craft.

England's Largest Engine

Perhaps the greatest contribution to large-engine development in England is the "Cub," Fig. 4, designed and built by D. Napier and Son, Ltd. This is a 16-cylinder, X-type, with reduction gears for driving the propeller. The four rows of four cylinders are in the form of an irregular cross. The piston displacement is 3,681 cu.in. and the rated brake horsepower 1,000 at 1,800 r.p.m. The weight has been reported as 2,240 lb., or 2.24 lb. per hp. Six of these engines were ordered by the British Air Ministry, but so far the 50-hour endurance test has not been successfully completed. Preliminary test runs show that the power output is nearly the amount expected, and one engine has been installed in a bombing plane.

The only large engine designed and constructed in this country during the war was the Duesenberg, Model H, a 16-cylinder, V-type. The output expected was 800 hp. at 1,800 r.p.m., the engine having a piston displacement of 3,393 cu.in. The direct-drive engine weighed 1,560 lb. This engine failed before tests were completed.

The U. S. Air Service was, therefore, without any reliable engine of over 400 hp. at the end of the war. During the following year, designs were laid down for an 18-cylinder, W-type engine of 2,778 cu.in. piston displacement, known as the Model W-1 and is shown in Figs. 5 and 6. This engine is composed of three rows of six cylinders each, set at an included angle of 40 deg. This type was chosen because it embodied the inherent characteristics considered necessary for an engine of this class. The arrangement of cylinders probably gives as compact an engine for the displacement as can be produced, having excellent inertia balance, and uniformity of torque delivered to the propeller.

The first of these engines was completed near the end of 1920. The rated horsepower was 700 at 1,700 r.p.m., and 750 at 1,800 r.p.m. but the dynamometer tests showed a much greater output. The original engine, except for the occasional substitution of a few parts, completed five 50-hr. endurance tests and made a total of about 300-hr. running. Never before has the first engine built from any design been known to have made such a record, nor has any engine of its class been known to complete tests of equal duration.

Durability and reliability are the two characteristics of prime importance in large engines, consequently our engineers gave weight but secondary consideration. It was believed that once a durable engine was developed, weight could be gradually reduced.

The weight of the Model W-1A engine is 1,770 lb. and at 800 hp. represents 2.21 lb. per hp. This is less than any of the six large engines described above with the exception of the Rolls-Royce Condor. Modifications indicate that the weight of this engine can be safely reduced to less than 1,500 lb. The weight per

hp. would then be 1.87 lb., the lowest value ever obtained for an engine of over 500 hp. and lower in fact than for the majority of smaller engines.

Flights have been made with the Model W-1 engines in two types of airplanes. One was an armored ground-attack airplane and the other a day bomber. Both of these airplanes are new designs and consequently there have not been as many hours flown as there would have been ordinarily in a ship, the characteristics of which were better known. The reports of pilots who have flown these ships, however, are extremely favorable as regards engine operation.

The selection of the 18-cylinder, W-type engine for outputs between 700 and 1,500 hp. has proved sound. The cylinder dimensions can be held within tried limits, the moving parts are in almost perfect balance and the power delivery is practically uniform. The overall dimensions assume good proportions for airplane installation, and the weight compares favorably with other large-type engines constructed to date. There are many problems connected with the design and development of the large engines, but our engineers have apparently been able to solve them. The U. S. Army Air Service now possesses one of the best bombing engines yet developed, also the experience which indicates that successful engines of 1,000 to 1,200 hp. can be built to weigh less than 1.5 lb. per hp. Fig. 6 shows the ignition end of the W-1A engine.

Is There a Shortage of Skilled Machinists?

BY A. W. FORBES

The complaint of the shortage of skilled all-round machinists is now being heard on all sides. I have said some things to this effect myself. Yet, when I look into my own shop, I find that every employee can set up and operate any machine in the shop, as well as wind and assemble motors, do simple welding, and the other jobs that are ordinarily found in machine shops. What is more they are all interested in the work, not one of them being willing to let a mistake or piece of poor workmanship get by, if he knows of it. (I added this last sentence as the youngest boy in the shop came into my office to check up a figure that I had given him. It did not look right and it proved to be an error.)

But am I satisfied? Not at all. I can see how much better machinists they might be, and as long as I see that, I follow the procession in complaining about the lack of skilled machinists.

I do not pay high, not as high as I would like to if business in the machine-tool line was reasonably good. It is about 65 per cent of 1920 rates. Yet they do not leave to work as general machinists in the numerous other machine shops of Worcester, as we would expect them to do if there was a real shortage. I have lost but one to the other machine shops in the last five years. Those that leave go into other lines which they think they will like better, or where the shortage is greater.

Before me is a curve from a prominent periodical giving the wages of toolmakers and foundry molders. In 1914 they were the same. Now the curve for molders stands 20 cents per hour higher. Molders received an increase of 125 per cent since 1914, toolmakers but 75 per cent. Such figures cannot be exact, but they are in line with general observations. There seems to be a real shortage of molders, which has given their organizations an opportunity to get wages well above other lines of equal skill.

However, there is a real shortage of the kind of machinists I want. Two illustrations may explain the situation. A few years ago I was interviewing machinist applicants, when one replied, "You do not want a machinist. You want a professor." At the time the soldiers were returning from Europe, one of them told one of my friends that I did not want a returned soldier, that I wanted General Pershing. On thinking over these replies, I think they do contain an element of truth. We do not find the men we want because we want more than is reasonable to expect. We want what to them seems unreasonable.

An ideal machinist would combine the knowledge and ability of the machinist as ordinarily understood with the occupations of mechanical engineer and production manager. I should like to hire a few of that kind at machinist's wages, but it is useless to expect to find one looking for a job as machinist. Yet we will persist in wanting such, even though we know we cannot find them. Such machinists should be the aim of apprenticeship, even though we know that the bulk of apprentices can never approach such accomplishments, and that if any do they will be more profitable to their employer if they give up their trade and become executives.

Proposed Tolerances on Plug Gages

The Committee of the American Society of Mechanical Engineers on Plain Limit Gages has devoted considerable time to the question of tolerances for the gages themselves. Not only have the committee members discussed the question from all angles but tentative proposals for standard tolerances have been submitted to a large number of engineers who are actively engaged in large production.

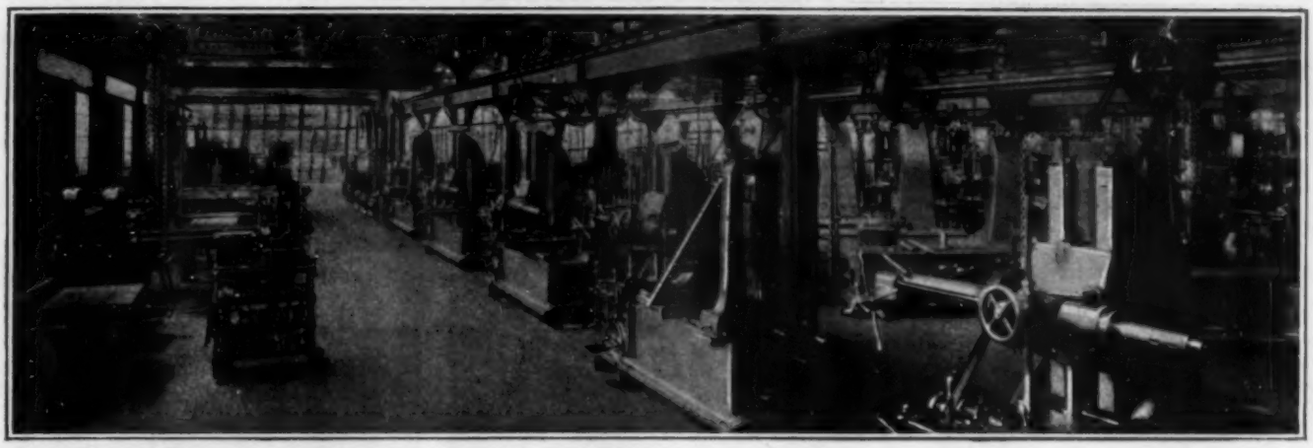
It has been decided to base the gage tolerance on the sizes of the gages or the dimensions to be gaged, disregarding the tolerance on the part itself. It was pointed out that a selection of gages by class took care of the difference in component tolerance.

The tolerances selected tentatively, to be submitted to members and others, are as follows:

PROPOSED TOLERANCES FOR "GO" PLUGS

	"X"		"Y"		"Z"	
Size of Gage	Limits	Tol.	Limits	Tol.	Limits	Tol.
0 — ½ incl.	.0000 .0001	.0001	.0001 .0002	.0001	.0002 .0003	.0001
½—1	.0000 .0001	.0001	.0001 .0002	.0001	.0002 .0003	.0001
1 —3	.0000 .0002	.0002	.0001 .0003	.0002	.0003 .0005	.0002
3 —8	.0000 .0003	.0003	.0002 .0005	.0003	.0005 .0008	.0003

It was pointed out that some want to use the "Z" gage at the machines—the "Y" gage at inspection and settle all disputes by reference to "X" gages. It was the opinion of the committee that this procedure was likely to be followed and hence there should be no paper interference between these gages—that is, that the "Z" gage should not pass any work that would be rejected by the "Y" gage made within its proper limits. This therefore means that there can be no overlap between the various classes.

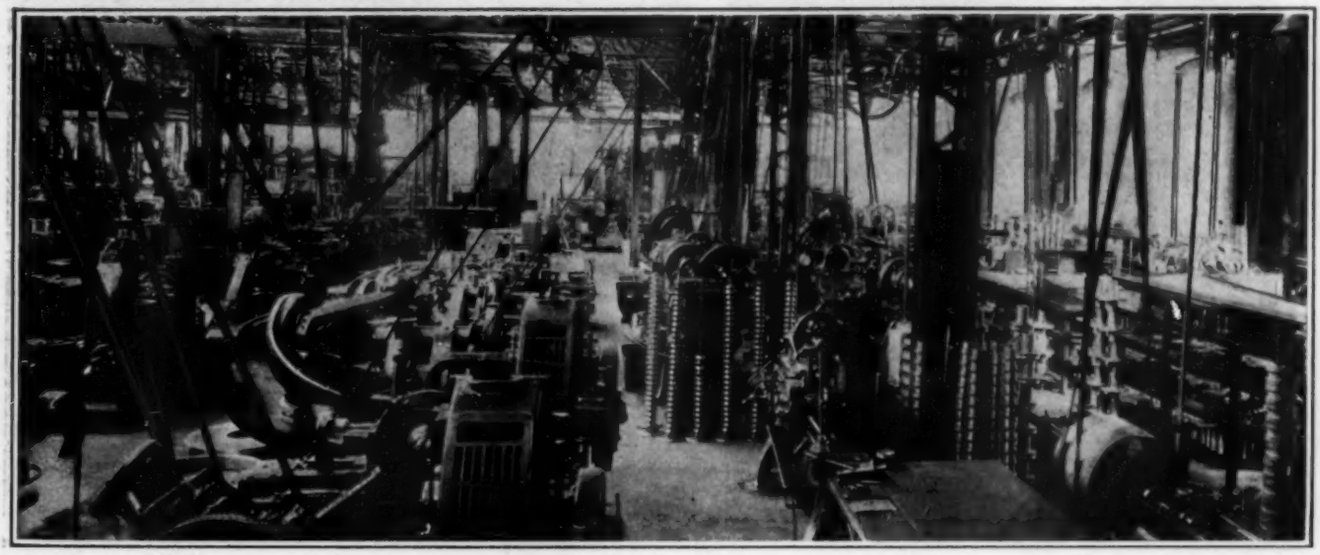


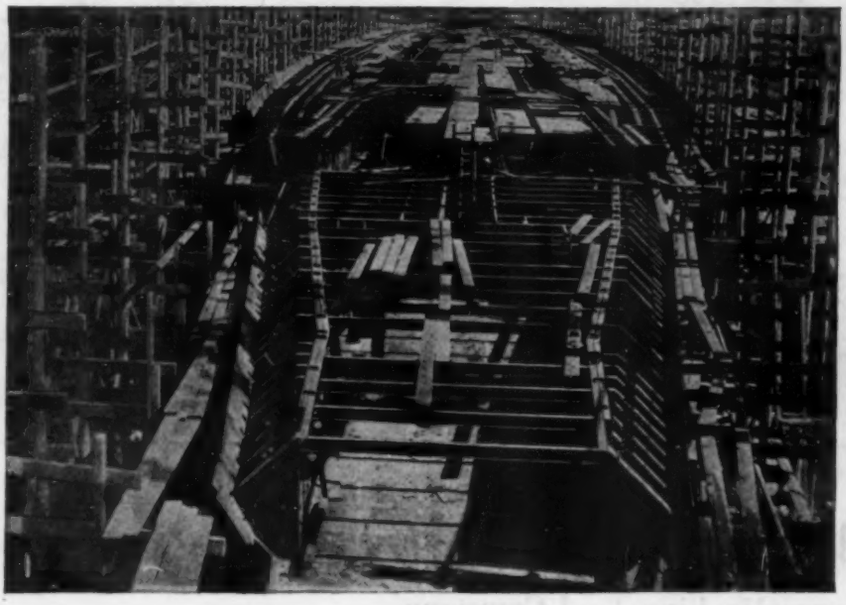
Where Machine Tools Are Made

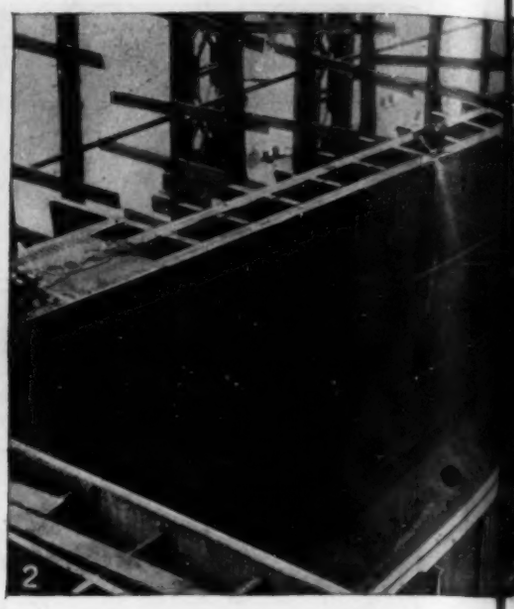
Lucas Machine Tool Company

Cleveland, Ohio

Established 1900





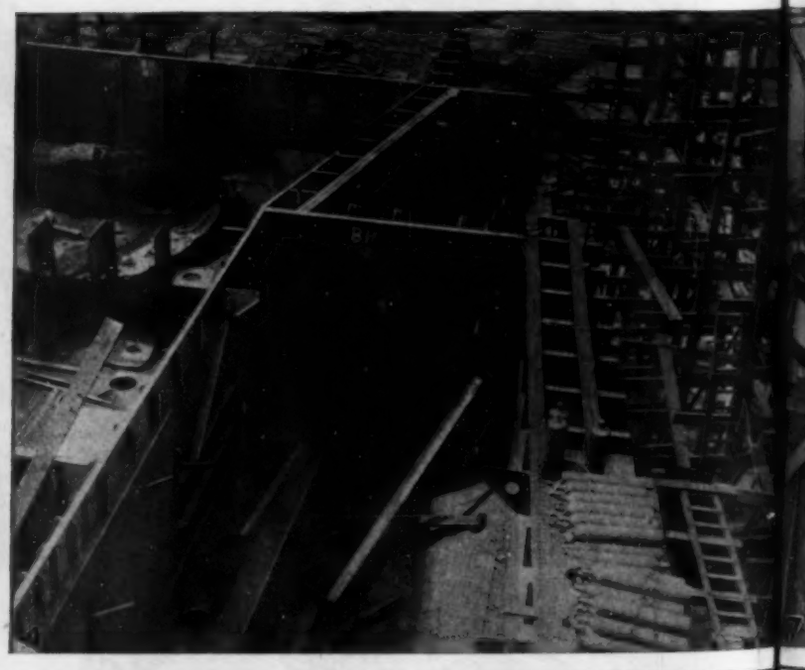


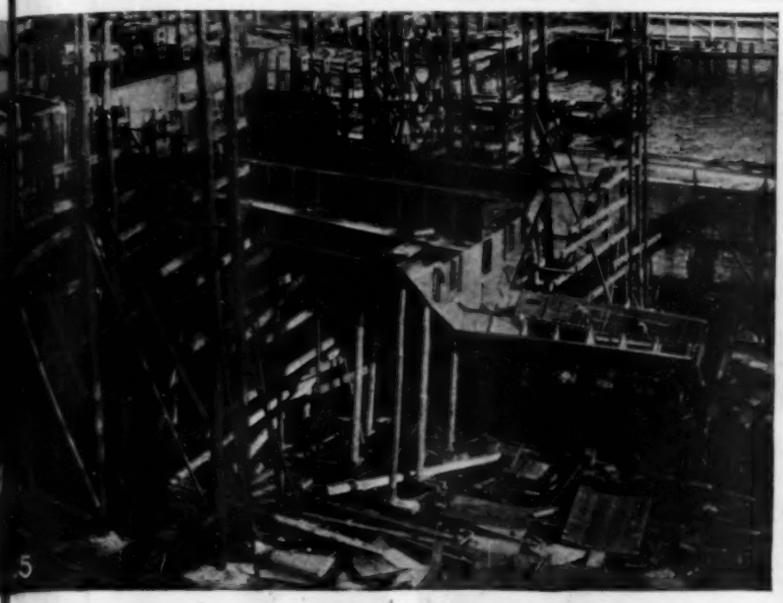
5-5-3 Ratio Hits

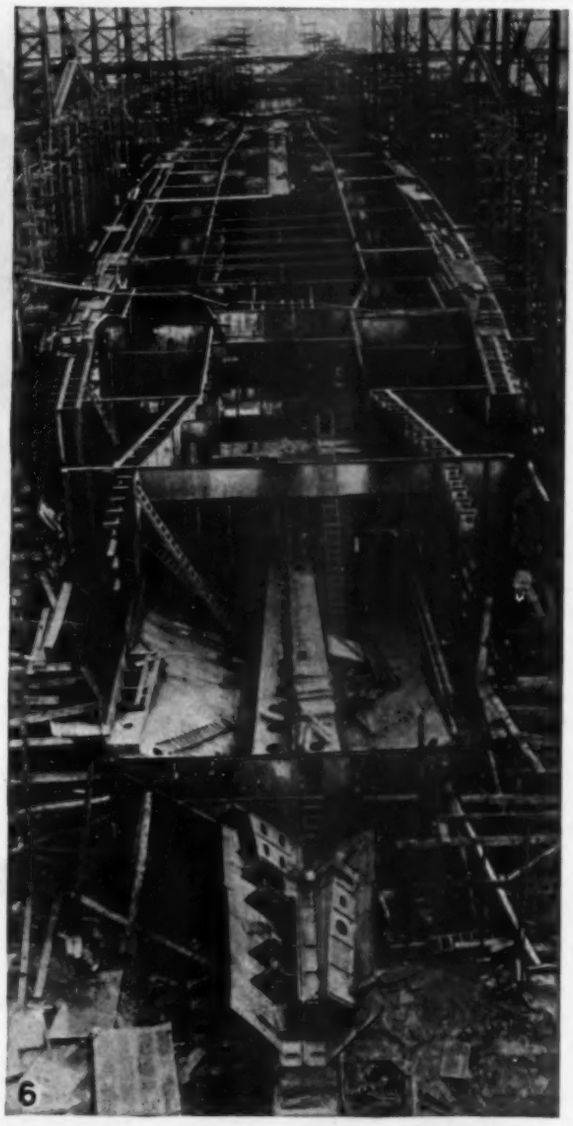
Fig. 1—U. S. S. Constellation as partially completed April 1, 1922 and before salvage work was begun. View looking forward

Fig. 2—Oxy-acetylene torch operator cutting bulkhead on starboard side

Fig. 3—Bow view of the "Constellation." The salvage work proceeds forward from the stern







the "Constellation"

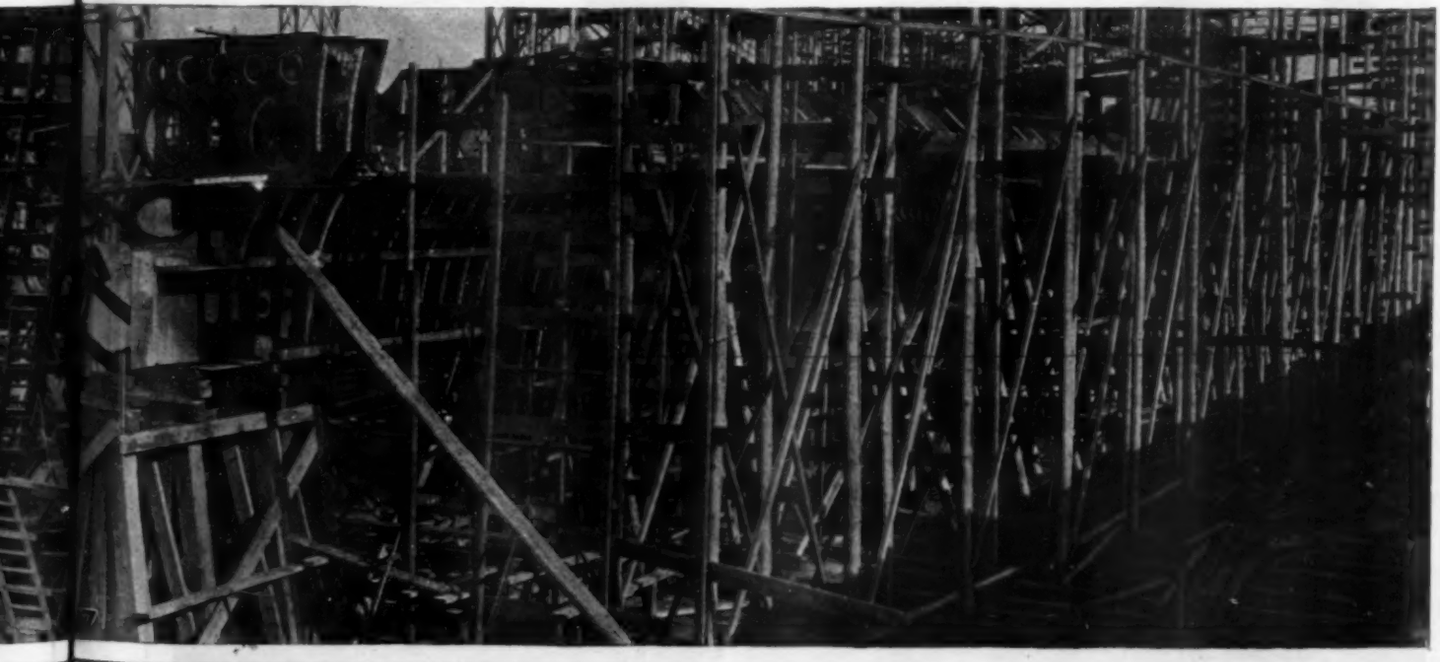
Fig. 4—Bulkheads near the stern partially scrapped. The operator is working on the double wall near the top of the picture

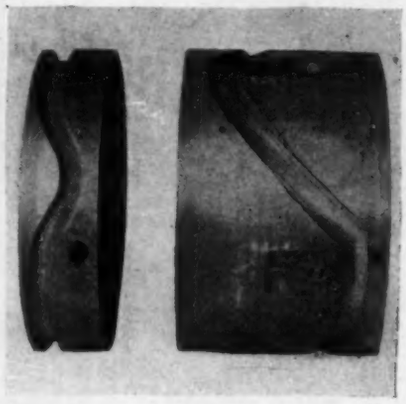
Fig. 5—Partially dismantled stern from the port side

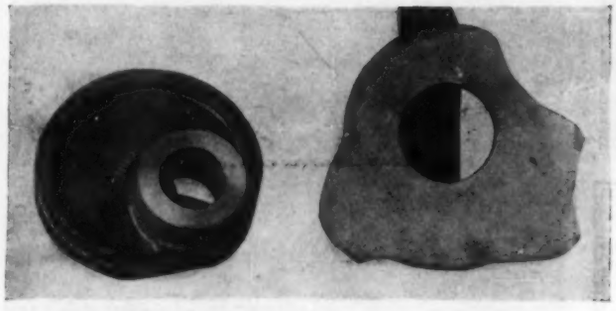
Fig. 6—View from the stern showing scrapping under way. Compare with Fig. 1

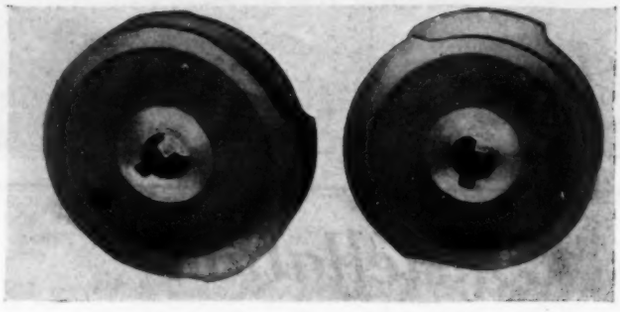
Fig. 7—The vessel at the time scrapping started. The salvage company will clear away all shores and staging as well as the hull itself

Photographs by courtesy of the Air Reduction Sales Co.



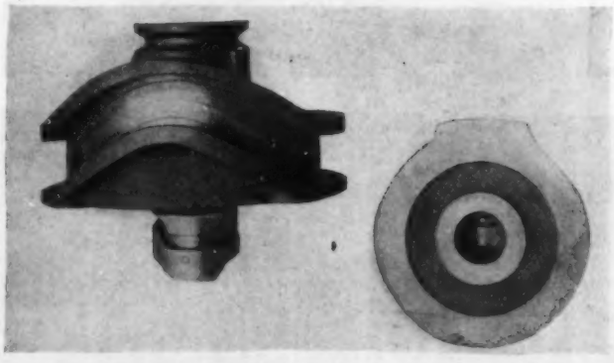


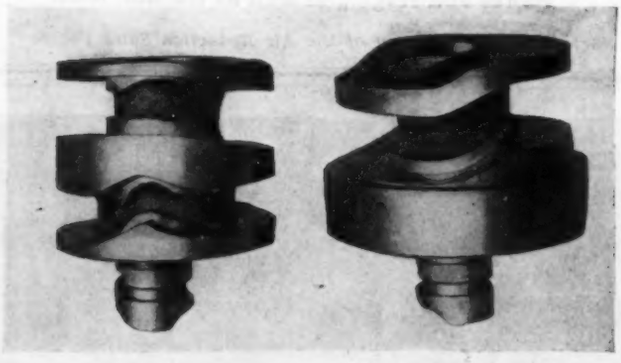


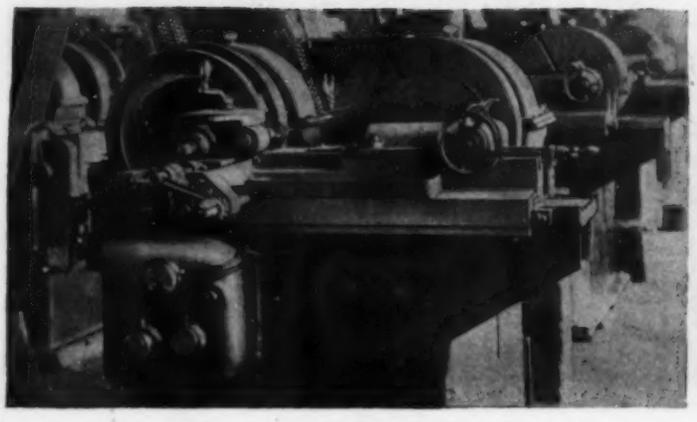


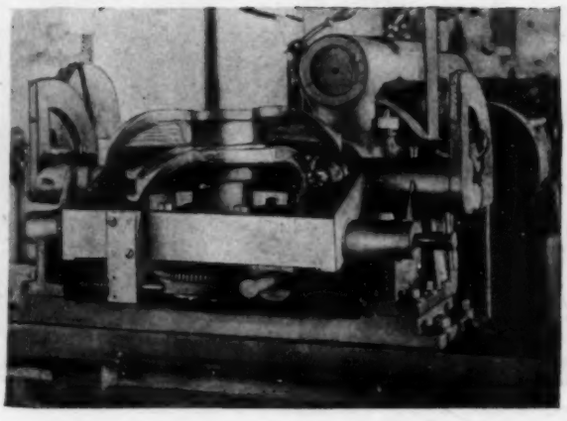
Examples of Cam Cutting

Photographs by courtesy of American Machine & Foundry Company, Brooklyn, N. Y.









A Simple and Economical Method of Handling Repairs

By Fred H. Colvin
Editor, *American Machinist*

How Gould & Eberhardt give quick service with low overhead charges—Service order department run like a small, independent shop with very little paper work

THE handling of repair work is a problem on which much gray matter has been expended in many shops. The object is, of course, to get repairs or repair parts for the customer quickly, and at a fair price and, at the same time, to show a little profit and not upset the production of the regular output. Both speed and cost are directly affected by the amount of system that has to be set in operation to get the order started, to follow it through the shop and finally to get it shipped or delivered to the customer. The fewer forms that have to be filled out, the fewer people who have to handle the order, the less will be the time and the cost and the fewer chances for errors to creep in.

It is told of the service department of a large automobile concern, that the intricate and cumbersome system employed made it impossible to get a fender out of stock for a customer who drove to the factory for that purpose, until the following day. The added cost due to such routine and delay, to say nothing of the exasperation of the customer, can readily be imagined.

Bearing all the factors in mind, Gould & Eberhardt, Newark, N. J., has worked out a very simple and direct system of handling all repair work. There is in fact, almost an entire absence of system as we usually know it.

All orders requesting prices and delivery dates on repair parts naturally go to the sales department and are forwarded immediately to the service order department, which is unique in a number of ways. The service order department is in charge of a foreman who has been with the company for many years and who is not only an excellent mechanic but is thoroughly familiar with the machines built by the company. This man has a small department, with equipment enough to handle most repair work. For special repairs he has access to other machine tools which are conveniently placed, arranging his time so as not to interfere with regular production.

SERVICE ORDER

ORDERED BY _____ CUSTOMER'S ORDER No _____
ADDRESS _____
SHIP TO _____
VIA _____ DATE ISSUED _____
PRICE _____ TERMS _____ DATE PROMISED _____
CHARGE ALL TIME, MATERIALS AND EXPENSES, ETC., TO J21652

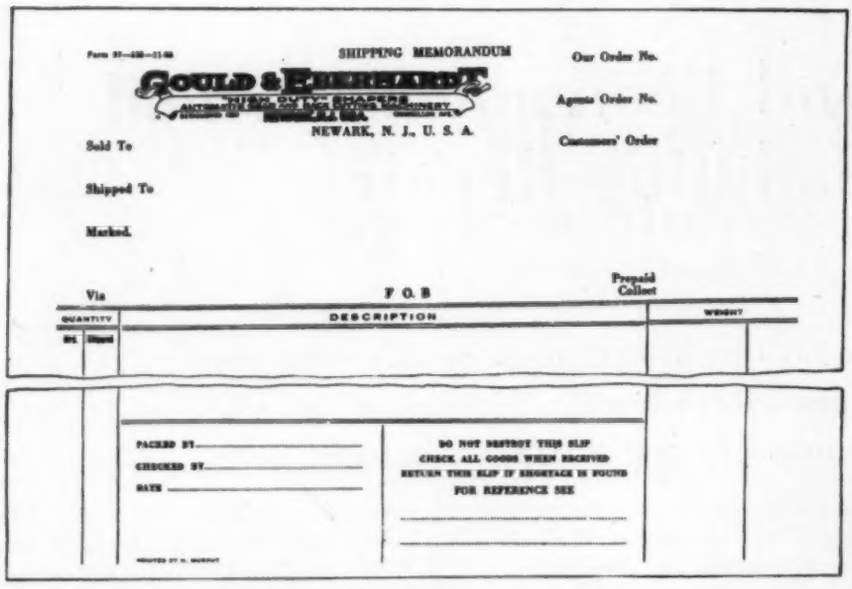
COST		SALES PRICE
DIRECT LABOR		
BURDEN (RATE C.)		LESS PER CENT TRADE DISCOUNT
MATERIALS		
PATTERN LABOR		PREPAID PARCEL POST
DRAWING LABOR		
FACTORY COST		CHARGE TO ACCOUNT
PER CENT. S. & A. EXPENSE		DATE SHIPPED
TOTAL COST		DATE BILLED

ACCOUNTING RECORD
ENTERED
OUTPUT JOURNAL No.

Fig. 1—Form used for service order

Perhaps the service order department can best be described as a small separate machine shop in which the boss is almost the whole works; who, with a clerk, looks after all the supervision and handles what little paper work there is. The customer's order goes direct from the sales department to the foreman of this little shop. The foreman interprets the customer's order and specifies the requirements on the service order form, Fig. 1, making two carbon copies. He notes the order number and the delivery date on the correspondence and returns it to the sales department, which acknowledges the order, specifies the delivery date and turns the correspondence over to the file clerk. All further correspondence is referred to the service order department direct.

If a blueprint is needed, the foreman or his clerk goes to the engineering department, picks out the tracing and orders the print, disturbing no one in the engineering department. Stock is secured in the same


SHIPPING MEMORANDUM

Our Order No.

GOULD & EBERHARDT

Agents Order No.

NEWARK, N. J., U. S. A.

Customers' Order

Sold To

Shipped To

Marked

Via F O B Prepaid Collect

QUANTITY DESCRIPTION WEIGHT

Rec'd Shipd

PACKED BY.....

CHECKED BY.....

DATE .....

DO NOT DESTROY THIS SLIP
CHECK ALL GOODS WHEN RECEIVED
RETURN THIS SLIP IF SHORTAGE IS FOUND
FOR REFERENCE SEE

Fig. 2—The shipping memorandum

way from the stock clerk, finished material or completed units being drawn from stock on memorandum, so that stock records are not disturbed. As nearly all the work is done in his department, the foreman can keep track of it as to progress and quality, acting as his own inspector. When the work is done and inspected, he makes out the shipping memorandum, Fig. 2, the shipping tag, packing list, and a postcard shipping notice to be mailed to the customer.

The service order department sends all completed material to the shipping department together with the second copy of the service order, Fig. 1, two copies of the shipping memorandum, Fig. 2, the shipping tag and the postcard shipping notice. The original copy of the service order, Fig. 1, goes to the sales department. The shipping department forwards the original copy of the shipping memorandum, Fig. 2, with the shipment and attaches thereto the shipping tag. The date of shipment is noted on the postcard shipping notice which, together with the duplicate copy of the shipping memorandum and the carrier's receipt, is sent to the sales department.

Figuring the Cost

The sales department then sends the original copy of the service order, Fig. 1, to the cost department. The duplicate copy is destroyed when received. The duplicate copy of the shipping memorandum, Fig. 2, and the carrier's receipt are filed for one year in the sales department and then destroyed. The postcard shipping notice is mailed to the customer.

The cost department handles the completed service orders as rapidly as possible, the cost being compiled on the original copy of the service order. After the date on which the cost is given is recorded, the service order goes to the sales department. Selling prices are established in the sales department, which prepares invoices in duplicate. The original goes to the customer and the duplicate to the accounting department, together with the original service order. After making the proper entries the accounting department returns the original service order to the sales department for filing.

Where the customer wants a price and delivery date before placing the order, the service order foreman specifies the requirements in detail and time required in days. The inquiry, together with all information attached, is sent to the cost department. Here the cost is estimated and itemized, and sent to the sales department which establishes the selling price, quotes the customer as to cost, terms, delivery, etc., and turns the correspondence over to the file clerk.

Opposite to this is the customer who orders the work done but who wants to know the cost and delivery date before the completion of the order. The main difference from the first case is that the service order specifying the requirements goes to the cost department for itemized estimates, and thence to the sales department where the selling price is established, noted on the original service order and the customer is notified as to terms, delivery, etc. The original service order goes back to the service order department and the correspondence is filed. All further correspondence concerning the order is referred to the service order department. When completed the order is handled as in the first case.

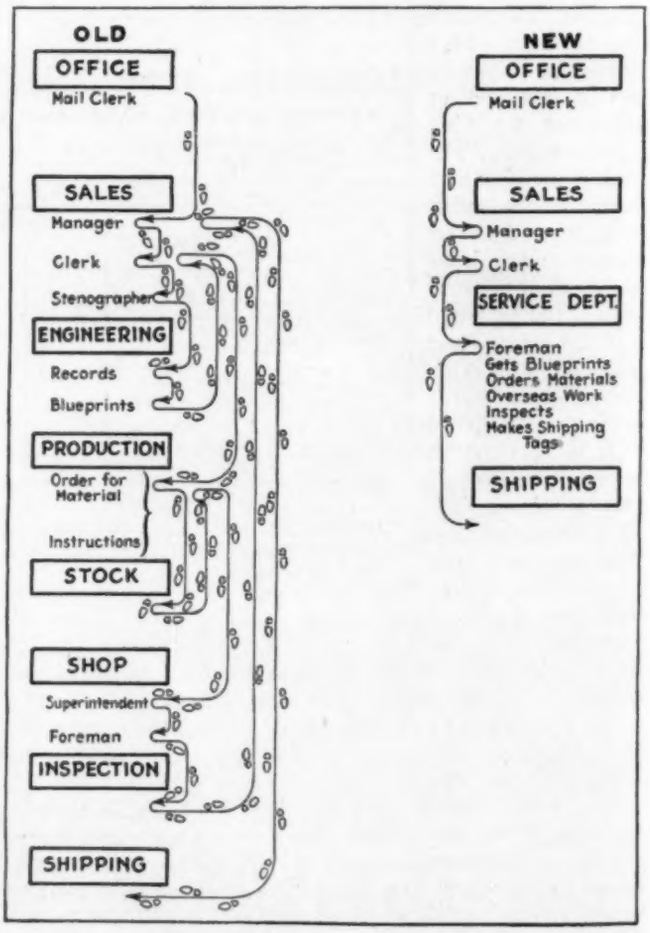


Fig. 3—Travels of an order under the old and new methods of handling service repairs in the Gould & Eberhardt plant

High-Production Machines in the Automobile Shops

The first article of a series concerning special, high-production machines used in the automobile industry

The "Simplimatic" Lathe

FOR many years factories specializing on certain products have been constructing, or have had somebody construct for them, special machines and groups of machines to expedite their work. One finds very large and complicated machines taking care of a great many operations at one time and one also finds groups of the very simplest kinds of machines so arranged that one group of machines does all the work required on a certain piece. As a rule, one operator handles such a group.

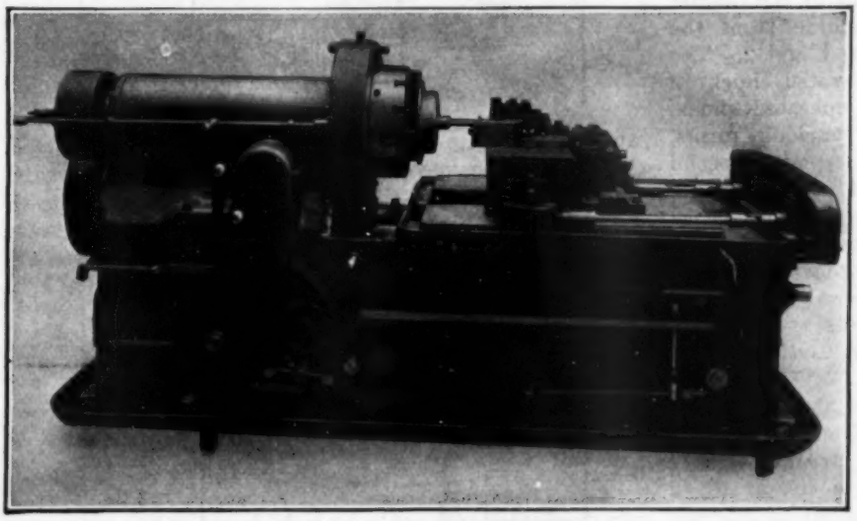


Fig. 1—Simplimatic lathe—front

Single purpose machines have been built for many years and some large establishments build such machines for their own use, leaving off all the features that were not of interest to them.

Such types of machines have generally been hidden away, not because the factories using them considered them as secrets but because the machines were of no particular interest to anybody else or, at best, to a few people only, so that there was no market for them and no machine tool builder would have thought of manufacturing them even if he had been aware of their existence.

With the advent of the automobile, a different set of conditions came into existence. The automobile industry comprises so many large shops devoted to a very few parts that special machines, single-purpose machines and grouped machines could be used in all of them. In other words, a market was opened for such machines. At the same time the cost and annoyances connected with building such machines in the shop of the user, made this method prohibitive and led the automobile people to demand of the machine-tool builder that he furnish the kind of machinery wanted. Not that the automobile builder expressed this demand in so many words; he was simply aiming for the same result that has been obtained in other shops. And, as a natural result, the machine tool-designer gradually struck the road which had

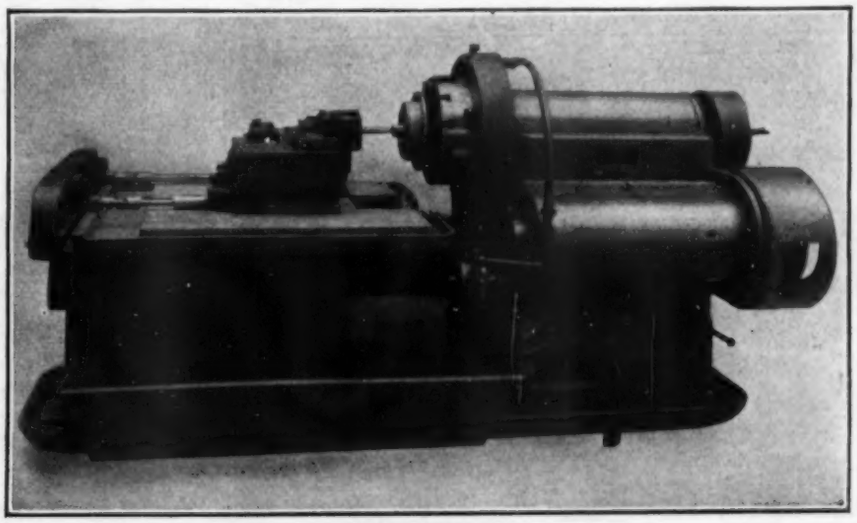


Fig. 2—Simplimatic lathe—rear

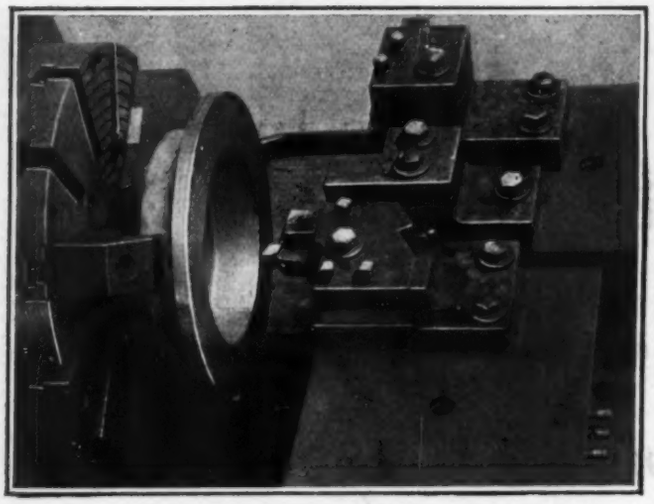


Fig. 3—First operation on automobile clutch-housing

been followed in other shops for many years but which had either been hidden from him or, if he knew of it, was not followed by him because it could not lead anywhere.

Among tools of the type in question is the "Simplimatic Lathe," an automatic machine built by the Gisholt Machine Co., Madison, Wis. The machine is of the horizontal type as can be seen in Figs. 1 and 2. The work may be held in a standard air-operated chuck, in any convenient size of standard hand-operated chuck, in air-operated chucking fixtures of various forms, standard or special, or on a standard faceplate. Special tailstocks provide support for centered work, or work mounted on mandrels. The tools are held in blocks mounted on tool slides of heavy construction which are provided with narrow guides. The slides are firmly secured on a wide, flat table in any required position relative to the work, permitting any slide to be set for turning and boring, facing and taking bevel or taper cuts.

The feed of each slide may be varied as required by the nature of the cut, and may differ from the feed of any other slide. The advantage of this arrangement is that each tool may start and finish its cut at times most advantageous to the co-ordinated action of all tools of the set-up, eliminating losses of time, overhang and tool interference. The table carrying the slides is

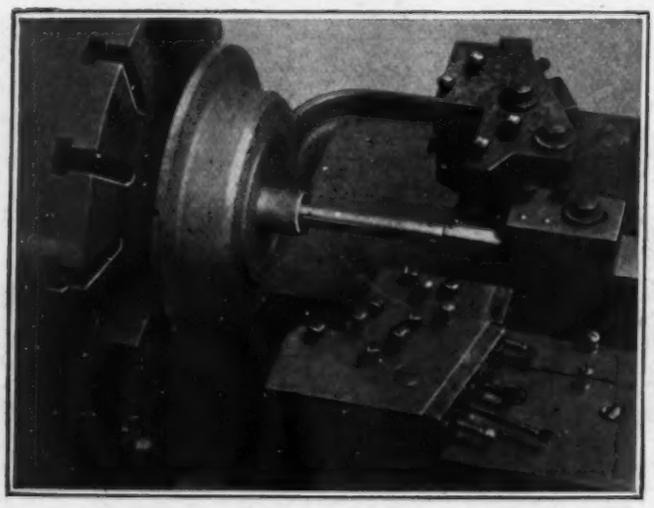


Fig. 4—Second operation on automobile clutch-housing

mounted on flat, wide ways of heavy construction and in standard practice is moved only to facilitate chucking and removal of work. Two spindle speeds are available during a cycle of operations, change in speed being

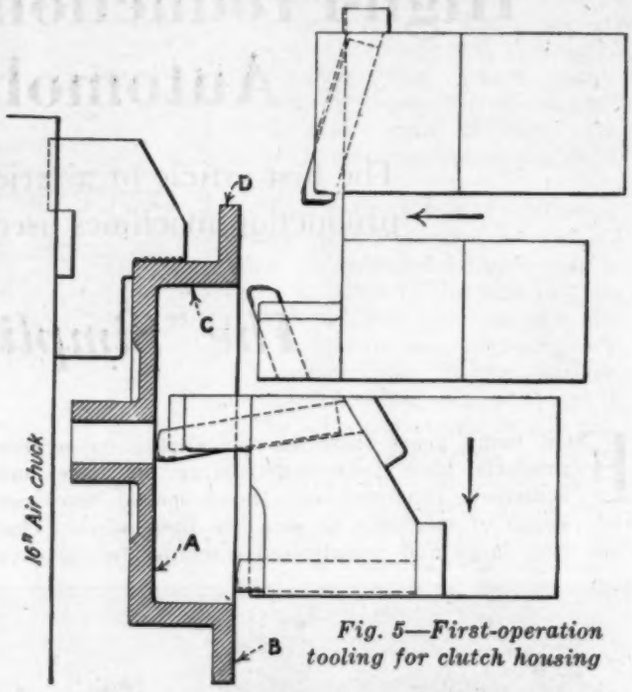


Fig. 5—First-operation tooling for clutch housing

automatic and adjustable to occur wherever desired. Various spindle speeds can be obtained by change gears. The range of feeds obtainable is wide. Retraction of tools is accomplished by rapid traverse or by reverse feeds.

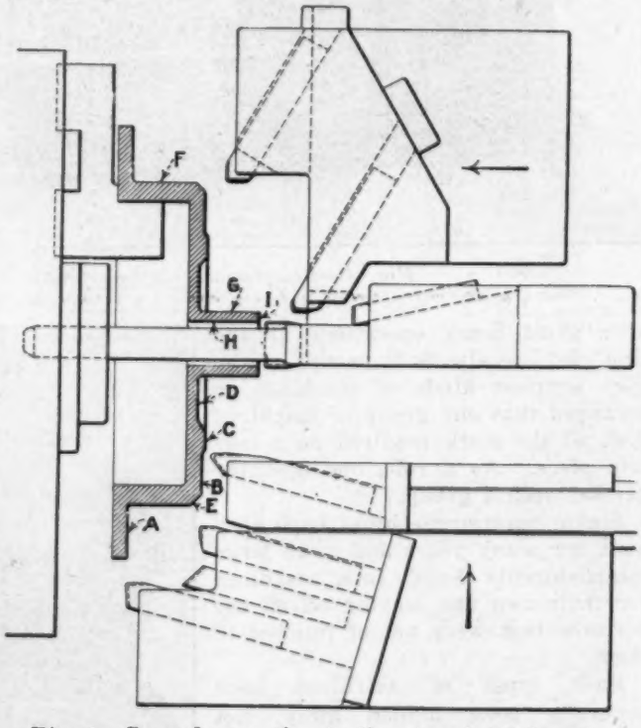


Fig. 6—Second-operation tooling for clutch housing

The operation of the machine is extremely simple. The work is chucked, the table advanced to working position, and the machine started. The several tools make their cuts, the slides return to starting position

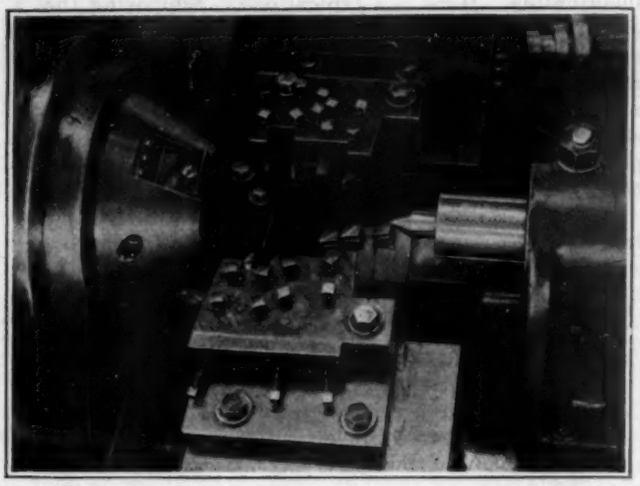


Fig. 7—Operation on automobile cluster-gear showing tools

and the machine automatically stops. The table is then moved back and the work removed from the chuck. The operator may stop the feed at any time, retract all tools to starting position or change speed by the use of accessible pedals and levers, should necessity arise to interrupt the automatic cycle. The working position of the table is determined by an adjustable dead stop which, when set, is rigid with the bed, giving a metal to metal contact definitely preventing longitudinal errors in the work.

As the machine requires no attention after it is started, one operator can handle as many machines as the duration of the cut permits. Since the machine stops when its operation is complete, the immediate presence of the operator is not required.

First and second operations on an automobile clutch housing are shown in Figs. 3 and 4, with line drawings of the tooling in Figs. 5 and 6, illustrating more clearly the tooling of the machines already shown in Figs. 1 and 2. The table carrying the tool slides is shown about half retracted in Figs. 3 and 4 to permit better illustration of the work chucked Referring to the first operation, Fig. 5, the front-slide tools face the surfaces *A* and *B* and the rear-slide tools bore *C* and turn *D*. Both slides stop their advance for a few revolutions of the spindle at the end of the cut to clean up the corner between surfaces *A* and *C*. Referring to the second operation, Fig. 6, the front-slide tools face surfaces *A*, *B*, *C* and *D*, and chamfer surface *E*. The front tool feeds to depth as the slide advances, faces *C*, holds the contour of the bevel and faces *D*. The rear-slide tools turn surfaces *F* and *G*, bore hole *H*, and face hub *I*. The feed of this slide is reduced to favor the tool which faces the hub, and both slides stop feeding for a few revolutions of the spindle to clean up the corners between faces *A* and *F*, *D*, and *G*. The tools on these operations are traversed out of their cuts. Machining time for the various operations in each machine is 2½ minutes.

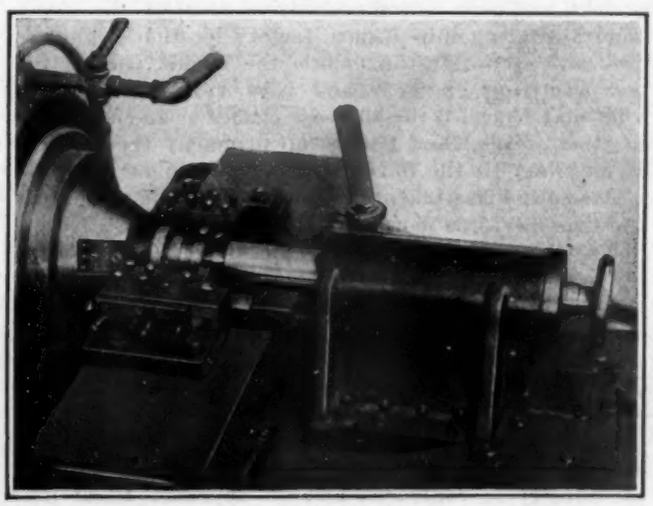


Fig. 8—Operation on automobile cluster-gear, piece in machine

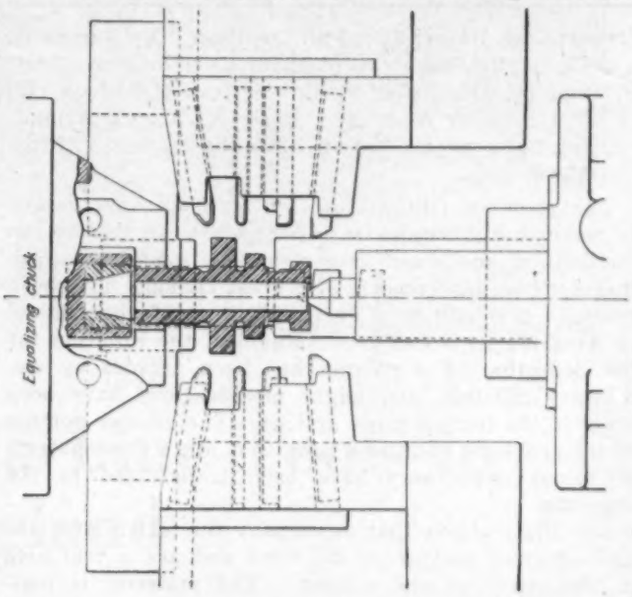


Fig. 9—Tooling for cluster gear

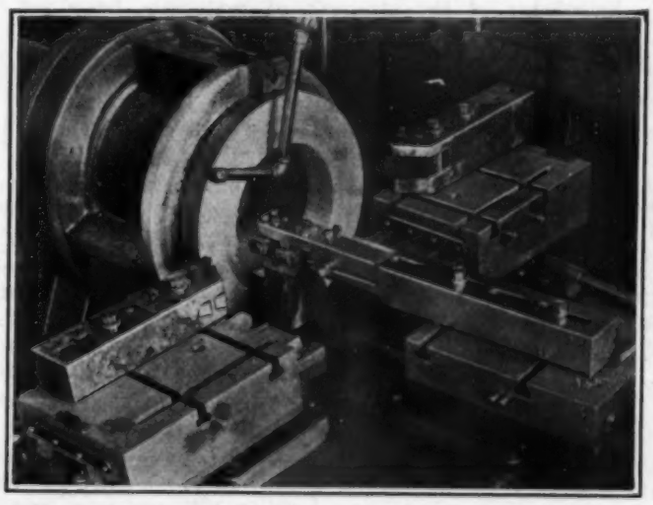


Fig. 10—Operation on 12-in. pipe flange

The set-up for an automobile cluster-gear which is machined in two minutes is shown in Figs. 7 and 8 and a line drawing of the tool arrangement in Fig. 9. The action of the tools is evident from the illustrations. Attention is called, however, to the combined tailstock and tool slide, standardized for stepped-turning operations of this nature, carrying a tool-holding bar in such a location as to offer least obstruction to the handling of the work and least trouble from chip accumulation.

In Fig. 10 is shown the tooling arrangement for

machining pipe flanges, steel or cast iron, threaded or straight-bore, with plain faces or with raised seats, with or without radii or chamfers in the bore, ranging from 2-in. to 12-in. sizes. The production time for an 8-in. extra heavy cast-iron pipe flange is 8 min. each. The standardized pipe-flange tools take all sizes and the toolblocks and slides are so designed as to permit changes in the size or type of work to be accommodated with the utmost ease and rapidity.

Book Reviews

Strength of Materials. Third edition. By James E. Boyd, Professor of Mechanics, Ohio State University. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York, N. Y. Cloth binding, 430 pages, 6x9 in., 255 illustrations. Price $3.00.

The previous editions of this textbook have served to make it well known as a comprehensive treatise on the subject, and a complete résumé of its features will therefore be unnecessary. No great changes have been made in this edition. The application of the method of Area Moments has been simplified, the equation for the deflection of a column has been derived by elementary calculus, and slight modifications have been made in the text of many articles. The greater portion of the problems have been rewritten, and a few subjects of minor importance have been transferred to the appendix.

The illustrations that accompany the text matter are an important feature of the book and are a real help in the study of the subject. The material is logically arranged and clearly treated, so that the student is guided properly through the subject and can obtain a knowledge of the strength of materials, based on fundamental ideas and enlarged by the consideration of the more intricate phases of the work.

Technique of Executive Control. By Ernest Haskell Schell, Assistant Professor of Business Management, Mass. Inst. of Tech. 133 pp. 5x6½ in. Published by McGraw-Hill Book Co., Inc., New York. Price $1.75.

Here is a little book that should be read at least once by every executive, from foreman up. As Professor Schell says, his book is not intended as a compendium of hard and fast rules for executive conduct but as a stimulus to clear thinking by men in executive positions.

The author begins by defining the distinction between executive, administrative and functional officials. He then mentions the three traits that are the outstanding requirements for executive success: interest in and affection for people; power of personality; and a scientific trend of mind. Executive tools are discussed in the next chapter and then executive control, executive stimulation, executive duties, difficulties with subordinates and difficulties with associates and superiors.

The method of treatment is a trifle confusing until the reader becomes accustomed to it but is then very satisfactory. First the immediate problem is presented in a paragraph or two. Under the heading "Executive conduct" advice is given as to the best way of meeting the problem. Finally, in smaller type several questions bearing on the problem are asked. They are not answered, their treatment being left to the reader's imagination. Here is a typical one: Supposing that a machine operator comes to you and complains that the operator on the night shift does not leave the machine in proper order. He further avers that he spoke to the night operator about it, but to no avail. The night shift is in charge of an executive holding the same position and authority as you. How would you handle this case?

Interest as a Cost. By Clinton H. Scovell. Published by the Ronald Press Co., 20 Vesey St., New York, N. Y. Cloth binding, 254 pages, 5x7½ in. Price $2.50.

Since an understanding of interest on investment is practically indispensable to cost accounting, this discussion of the advisability of the inclusion of interest as a cost will be found timely and practical. The author upholds the contention that interest is properly a cost item; he has endeavored to examine every objection to such procedure that has appeared; and he answers such objections clearly and fully. All parts of the discussion are illuminated by practical examples in cost accounting, as well as court opinions and quotations from leading economic authorities.

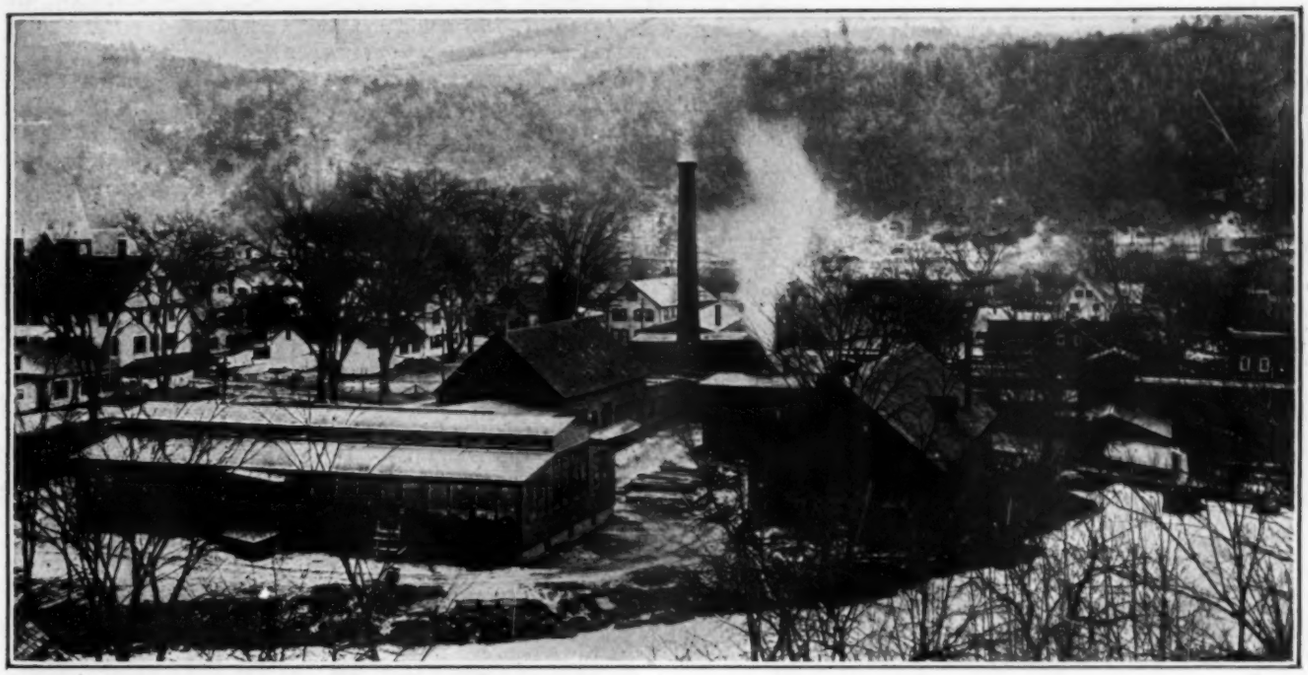
The substance of the interest-as-a-cost theory is that a cost for the use or service of capital exists just as much as does a cost for the service or use of labor or land. The treatment of interest as a profit is held to be a misapplication of the interest theory, and the reasons for such misapplications are treated at considerable length. The whole question touches the economic field and the author displays exceptional knowledge of the governing factors and the fundamental ideas upon which the theory of interest is grounded. The discussion will be found to be readable and practical by the average executive as well as the student of cost accounting.

Management Engineering. By P. F. Walker, M.M.E., Professor of Industrial Engineering and Dean of the School of Engineering at the University of Kansas. 359 pp. 5½x8 in. Illustrated by charts, line drawings and halftones. Published by McGraw-Hill Book Co., Inc., New York. Price $3.50.

Dean Walker divides the subject matter of his book into two parts, the first being intended to give the student engineer a comprehensive idea of the many factors entering into modern factory location, organization and administration, while the second part is for the practising engineer and pays more attention to what may be called the business phases of an enterprise. In other words, Part I takes up primarily the physical factor, Part II, the financial, legal and human factors.

The author has taken his material from many sources and has perforce done a lot of condensing. Nevertheless the reader gets a clear picture of the economics of factory management and can follow up any particular phase by referring to the complete bibliography at the end of the book and to the more specific sources listed at the end of each chapter.

At the end of each of the two parts is a series of exercises that may be used to test the degree to which the reader has mastered the text. In addition there is an appendix A, containing 35 pages of small type on the subject of contracts, and an appendix B, of nine pages, illustrating various forms used in company organization.



Development of Machine Tools in New England

By Guy Hubbard

The twentieth article—Organization of the Windsor Machine Co.—Expenses of selling—An efficiency expert on the job—Early automatic screw machines

WHEN it was decided to move the Jones & Lamson Machine Co. from Windsor to the new location in Springfield—Windsor stood face to face with a very serious situation. After fully sixty years of mechanical development, this village of inventors was to be left without a machinery industry—her historic shops stripped bare even of their shafting.

Many of the Jones & Lamson mechanics had been born and brought up in Windsor, and had learned their trade under Robbins & Lawrence or under some of the later Lamson concerns. Not only had these men established their permanent homes in Windsor, but they felt a strong personal pride in her machinery industries. They refused to sit quietly as the Windsor shops closed down, and their joint efforts resulted in the establishment of the Windsor Machine Co., which by the purchase of the machine-shop property on the north bank of Mill Brook, found itself in possession of a heterogeneous collection of rather dilapidated buildings, as shown in the headpiece. They were bare of equipment other than a rickety steam engine, a leaky boiler, and a rheumatic waterwheel with a very uncertain supply of water behind it.

Before anything could be done, mechanical equipment was necessary, and this problem was solved by the closing out of a machine business in the town of Mansfield, Mass., known as the "Spindle Shop," where for many years John Birkenhead had been manufacturing lathes of various sorts, a patent arbor press and other mechanical specialties. Mr. Birkenhead wished to retire, and the Windsor Machine Co. purchased twelve of his engine lathes and certain patents thereon, a lot of other machine tools used in building lathes, a number of arbor presses and a miscellaneous collection of small tools, rough castings, jigs, fixtures and patterns, all for the sum of $6,136.28. This "plunge" almost wrecked the new company.

The Birkenhead machinery was moved to Windsor in 1889, and a force of twenty-five, mostly veteran Windsor mechanics, see Fig. 143, were set to work. The first thing done in the line of manufacturing was to redesign the Birkenhead engine lathe, shown in Fig. 144, and to build several of them. The building of the first twelve Windsor wire-feed screw machines was begun soon afterward.

The engine lathe busines was altogether too much cut up by competition to allow a small, new concern to prosper greatly in it, so in 1890, the directors decided to abandon it in favor of the Windsor wire-feed screw machine.

For the author's forthcoming book. All rights reserved.

Fig. 143—The original force of the Windsor Machine Co. (1889)

Drawings and patterns were prepared at Windsor for a wider and improved line of the so-called high turret lathes with numerous refinements, see Fig. 145, and it was also advertised that the company would design and build any sort of special-purpose turret lathes, or other machinery. Signs of prosperity now became apparent, and the directors voted to present each of the seven apprentices with a year's subscription to the *American Machinist* Later they voted to begin advertising in that paper, and shortly afterwards in the *Iron Age*. In the latter part of the year they gladdened the hearts of the stockholders by declaring a dividend of three per cent. This was followed on Jan. 3, 1891, by a further dividend of two per cent, and on May 31st of that year the capital stock was increased to $35,000. More prosperity was indicated by the dividend declared, on Jan. 2, 1922, of five per cent.

In an attempt to keep the shop running during the business depression of 1893, the foreman, Samuel A. Reed, was sent on a selling trip, which included Elmira, Albany, Scranton, Pittsburgh, Cleveland, Cincinnati, Louisville, Nashville, Chattanooga, Richmond, Baltimore, Wilmington and New York. In the meantime, in July, the shop was forced to close down. Mr. Reed returned in August and presented the directors with a few orders and an expense account of $171.10, which apparently caused such dire distress that he offered to resign. Traveling seems to have been quite a different proposition in those days from what it is at present,

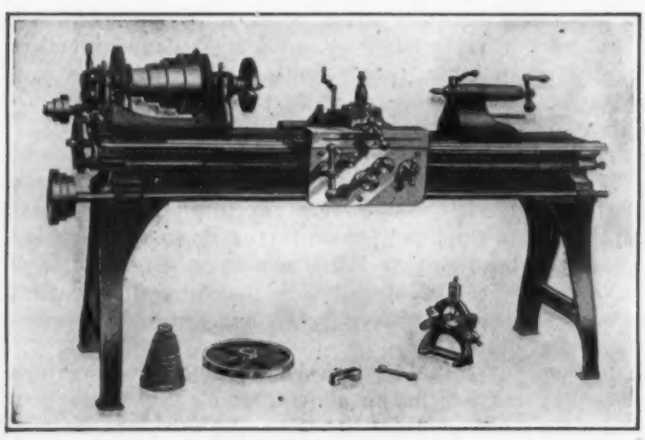


Fig. 144—The Windsor engine lathe

if this account could be then considered so terribly extravagant.

The company somehow managed to weather the storm, but could not seem to recover from the effects of it, and while it was still in this weakened condition, Herbert S. Wilson, efficiency expert, appeared before the disconsolate board of directors. He seems to have electrified them by his plans, and he was immediately employed for one month on trial, at the then large monthly salary of $125, "to investigate the workings of the company and advise as to sales and management, and work for the company's advantage according to his best skill and judgment." This trial was followed by his appointment as superintendent, at a salary of $1,500, for one year.

The problem of selling was the most difficult one faced by the company. General sales agents did not seem to push the line with sufficient vigor, and, as indicated by the experience of Mr. Reed, the expenses of direct selling ate into the profits in a manner that sent

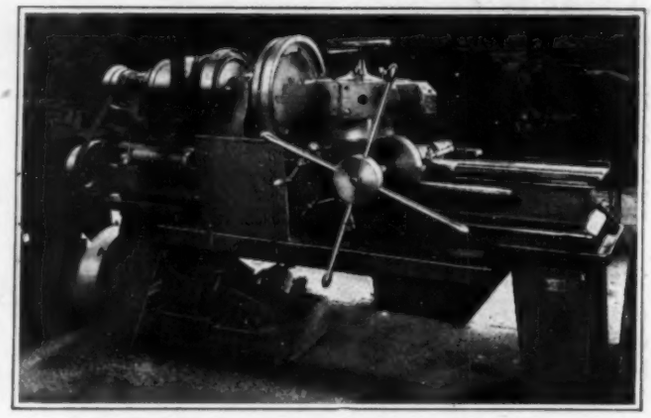


Fig. 145—An early Windsor turret lathe. Still in use at the Windsor plant

chills up and down the backs of the cautious directors.

Under Mr. Wilson's plan the troubles seemed to be at an end and the company was so impressed by his apparent success that, in 1896, it leased the entire plant to Mr. Wilson and a friend of his by the name of Wheeler, for a period of ten years. This Mr. Wheeler was a promoter of the most pronounced type, and after joining with Wilson as the Wilson-Wheeler Co., he organized the Turret Machine Co. and started a whirlwind campaign of manufacturing and selling turret lathes. Unfortunately promotion overshadowed manufacturing, and the market was flooded with machines that were simply thrown together.

In less than three months the bubble burst, and Mr. Wheeler decamped, leaving Mr. Wilson, who was really a good designer and mechanic, "holding the bag." In May of the same year the directors of the Windsor Machine Co. took over the business—"sadder and wiser men."

In 1897, there appeared before the board of directors, a young man who was destined to exert a great influence upon the Windsor industry. This was George O. Gridley, whose visit was not immediately fruitful of results, but foreshadowed what was to come. In the old record books it is commemorated by the entry: "Mr. Gridley was present, and the matter of building an automatic machine for him was discussed."

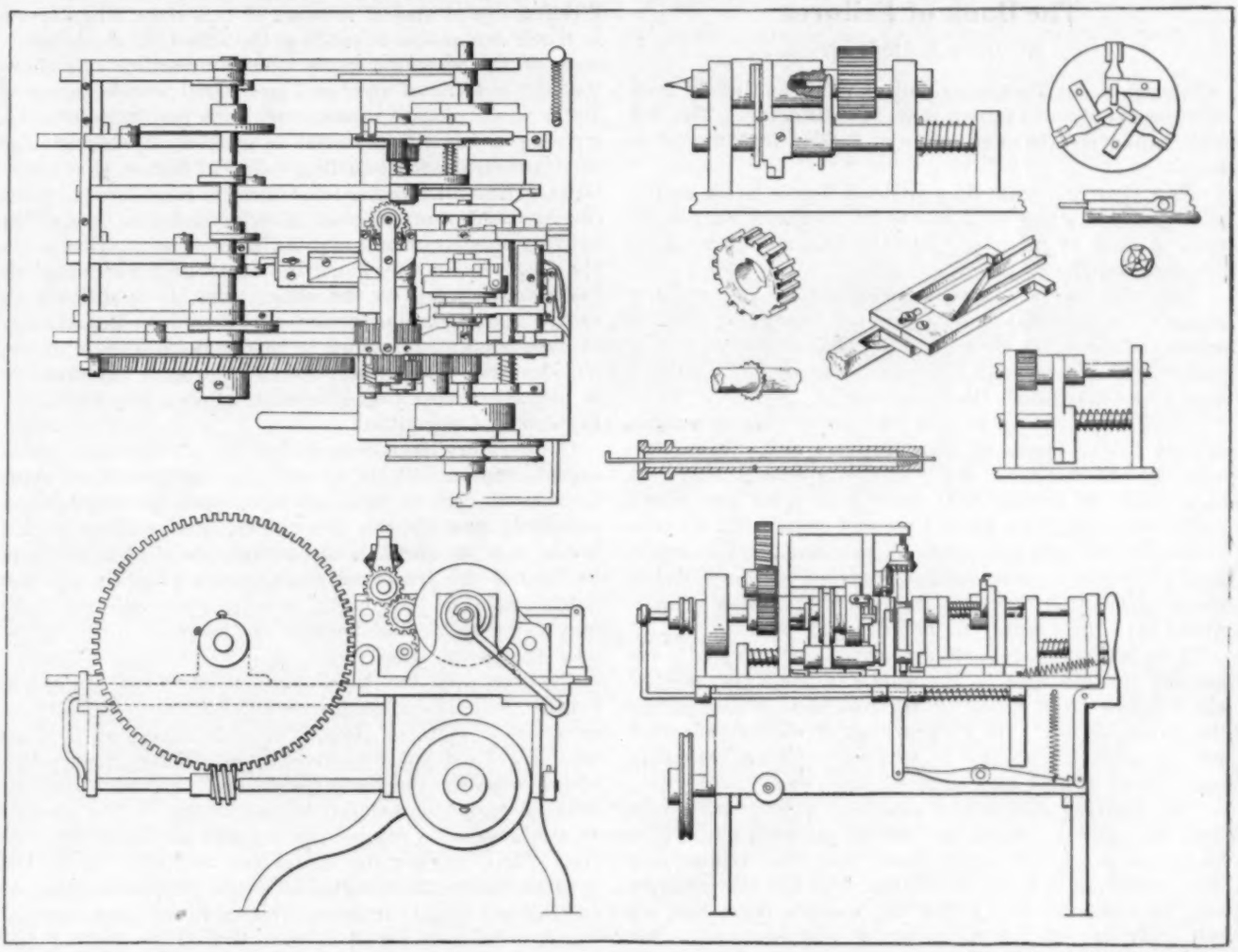
As early as 1817, Phineas Doll and Daniel Treadwell

of Boston invented a machine, probably automatic, which turned out finished wood screws from a coil of wire at the rate of ten a minute. This was followed in 1852 by another automatic machine, not of the turret variety, invented by Newell North and used successfully at Middletown, Conn., for the manufacture of screws. The field for such a machine was then so limited that it was soon discarded in favor of the hand-operated type. The writer has uncovered another such instance in the invention of Francis Curtis of Brattleboro, Vt., in 1871, of an automatic screw machine, which was likewise not of the turret variety.

Francis Curtis, a Canadian mechanic who attended school but three months in his life, came to Brattleboro, Vt., in the late '60s, where he worked for a time in the jobbing shop of S. M. Spencer, and later set up a shop of his own in West Brattleboro. He was interested in the development of the early velocipedes or "bone shakers," which were the forerunners of the modern bicycle, and in this connection he is said to have invented the wire wheel.

In spite of his meagre education and an entire ignorance of mechanical drafting, Mr. Curtis was able to conceive very complicated mechanical devices, and to build them "out of his head" by the use of wooden models. It was in this way that he developed and built the straight line automatic screw machine, which he patented in 1871.

This machine, an assembly drawing of which is shown in Fig. 146, was first built in the West Brattleboro shop, and consisted of a modified form of lathe headstock having a hollow spindle containing the modern type of chuck, or collet, and fitted with a bar feeder at the rear. At the rear of the machine frame was a cam shaft parallel with the spindle, and driven from it by a worm shaft. On the cam shaft were several sets of disk cams, which operated cross-sliding draw bars. The draw bars, either directly, or through the medium of flat cams to change the direction of the motion, automatically actuated all parts of the machine, including the mechanism for feeding the stock, turning the body of the screw, cutting it off, slotting it, threading it, removing the burr, finishing the head, and finally ejecting the finished product into a pan. Instead of employing a turret, the screw was cut off from the bar after the initial turning operation, and was carried by a set of iron fingers mounted on a slide, to the revolving tools that performed the other operations.



(From the Patent Records)

Fig. 146—Assembly and details of Francis Curtis' straight-line automatic screw machine (1871)

Curtis was backed by Henry Devens of Brattleboro, and sets of his machines were placed in the Springfield Armory and in the Wheeler & Wilson sewing machine plant at Bridgeport. These machines gave satisfactory and quite surprising results. At the Armory they doubled the output of finished screws per operator, and at the Wheeler & Wilson plant, it was found that one man could easily run at least eight

machines. Mr. Devens also sent Mr. Curtis and his automatic to the Paris Exposition, where it received much attention and was described at length in the *London Times* as one of the most interesting of the mechanical exhibits. While this machine was still in the experimental stage, the Spencer automatic turret lathe appeared and predominated the market, and in spite of all these successful trials and favorable publicity, the Curtis invention soon dropped out of sight, and has generally been forgotten. Francis Curtis died in Worcester, Mass., about 1900—a poor and unknown inventor.

The Book of Failures

BY JOHN R. GODFREY

Johnson's son Tom is as full of ideas as the old man ever was, only of course they are different. The old man hailed me the other day as I blew into his office with—

"Say, Godfrey, what do you think Tom's latest notion is? Couldn't guess in a month of Sundays, so I'll tell you. A book of failures. Has the title stamped big as life right on the front cover."

"Yes, dad," says Tom who has just come in, "and it's going to save the Johnson Motor Company a wad of money as the years go by. If you hadn't been so dern proud and told me only of your successes, I wouldn't have made that break the other day.

"If all of us young fellows who are trying to wabble around in the shoes of their daddies and others who built up the business, knew of the mistakes that had been made, of devices that have been tried and didn't work, we could save a lot of time and money. If we only knew just the mistakes made in this one plant it would help a lot, but suppose we had a record of the mistakes made in the other plants in this same line, think what it would save the country in dollars every year."

"Tom always was a philanthropic sort of bird," remarked the old man. "He wants to help prevent the other fellow from spending his good money finding out things as we did. He forgets that if we let the other fellow spend his money in making mistakes, we may have fewer competitors some of these days."

"Mr. Godfrey, dad talks a good deal more like a pirate than he really is. Guess he likes to get me going. Mistakes cost every firm more money than they realize, and this means not only the individual firm but the industry and the whole country. One big manufacturer told me the other day that if he could cut out mistakes in his plant he could pay everyone the same salary and only work four days a week. Of course we can't cut out all mistakes as long as we are human, and that's likely to be for several days to come. But I do believe we can prevent a lot of lost motion if we can stop making the same mistake over and over again with regard to special tools and other devices.

"I propose to make a note of everything we try that doesn't pan out, and try to tell why. Because conditions may change some of these days so that the same thing would be a success. I believe we can learn more from failures than from successes, probably because there are more of the former. And we are very apt to remember the successes without any reminder. Our pride looks after that.

"This Book of Failures is going to be open to anyone in town. If we can prevent the spending of ten thousand dollars a year in things that don't work, we'll have that much more to spend for something worth while. And we can learn as much from the other fellow as he can from us. Putting all the mistakes together, we ought to learn a lot more. When we get backbone enough to acknowledge that we sometimes guess wrong, we'll all be better off."

Recommended Practice for Cutting and Welding

Some of the findings of the committee of the American Railway Association on Autogenous and Electric Welding are of special interest at this time, when there is much discussion regarding the effect of these processes on the materials welded. The investigations show that the welding of steel and steel-tired wheels causes a distinct local change in structure with resultant internal stresses unless the material is properly preheated and then annealed after welding. The different characteristics of the filler metal must also be considered. With the gas weld, a pronounced decarburized area is formed between the base metal and the filler metal, so that parting frequently occurs along the decarburized zone. With the electric weld, on the other hand, it is difficult to secure good adhesion unless a rather deep penetration of heat is obtained, which in turn sets up greater internal stresses. For these reasons welding of such wheels is not sanctioned. The welding of couplers and their parts is not permitted.

Gas welding is recommended for all cast-iron parts except wheels. Welds of 100 per cent, without reinforcement, can be obtained by proper preheating and annealing and by the use of cast-iron welding sticks. When it is not possible to preheat, the electric arc may be used if the fractured surfaces are properly studded before welding. Wrought iron or steel welding-sticks may be used. This method is, however, only to be used in special cases.

Cutting with the torch has an effect on the metal similar to that in welding. Low-carbon steels of approximately 0.25 per cent (commonly known as 25-point steels) are not appreciably affected. For higher-carbon steels, however, the torch should only be used where the affected metal is removed by machining or the piece is so annealed as to remove the stresses set up by the cutting. The thicker the metal cut with the torch, the greater the depth of metal affected. Either welding or cutting will impart internal stresses to the base material in approximately direct ratio to the carbon content and in inverse ratio to the original temperature of the base material. These stresses are produced by the local transformation of structure, caused by heating the surface metal to a temperature above the recalescence point while the underlying cold base-metal acts as a quenching medium. Under normal conditions any detrimental effect on the base material can be prevented by sufficiently high preheating or removed by subsequent annealing.

The electric method is recommended for welding boilers and fireboxes, because of the smaller amount of heat imparted to the sheet as compared with the gas method, and the subsequently smaller amount of expansion during welding. The edges of sheets or cracks must be properly prepared by chipping or machining. Cutting torches should not be used for this work. Vertical welds should be avoided and all patches should have rounded corners.

Standard Punch and Die Sets

By Sidney Diamant
President Diamant Tool & Mfg. Co., Inc., Newark, N. J.

Time and original cost saved by standard equipment—Types of die sets—Shall liner-pin bushings be made of cast iron or steel?

STANDARDIZING small tool equipment is as much a necessity in economical manufacturing methods as determining the proper sequence of operations and the degree of interchangeability in the parts manufactured, to constitute a functioning unit.

Builders of small tools are so standardizing their products that they may be interchangeably used with various makes of machine tools. In like manner, many advantages must accrue from the standardization of accessories.

Standardization of accessories, when practiced by a concern having in mind only its own specific requirements, may be limited in the scope of its accomplishments, although apparently each company is convinced in its belief of having attained the goal of operating most efficiently.

Many concerns have developed their own punch and die sets, based principally on their own specific product of manufacture. These concerns have had to expend effort in grouping their products, in analyzing the various operations to be performed in the manufacture of each article, in the purchase of material and in routing

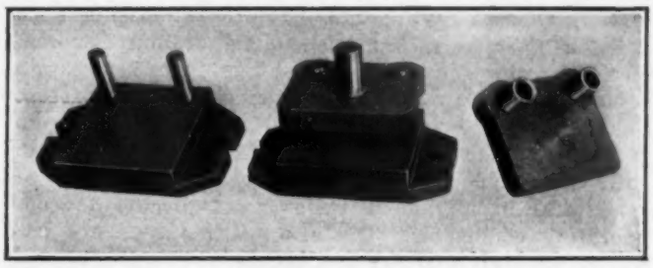


Fig. 1—Punch and die set with steel liner pins and bushings at the rear

the work for the punch-press operators. The consideration then begins as to proper type, size, design, checking, approval, construction, and tryout of punches and dies, to suit the purpose.

If all companies producing metal stampings or the intermediate tools for the making of such stamped parts, would render themselves more receptive to ideas of standardization having a general application, does it not seem plausible that the many additional advantages must be to their gain?

It is essential that manufacturers of standard punch and die sets shall have considered the following to properly serve their users:

(a) Market requirements as to sizes, styles and types.
(b) Makes, sizes and styles of punch presses used.

Abstract of paper for the Machine Shop Division, Metropolitan Section A.S.M.E., April 15, 1924, at Newark, N. J.

(c) General calculations for sections to resist stresses of compression, tension and bending.
(d) Common sense proportions based on experience and good practice, where mathematically-obtained conclusions might not justify the metal distribution practically adopted.
(e) Quantity-production methods that are critical as to completeness, material, workmanship and inspection.

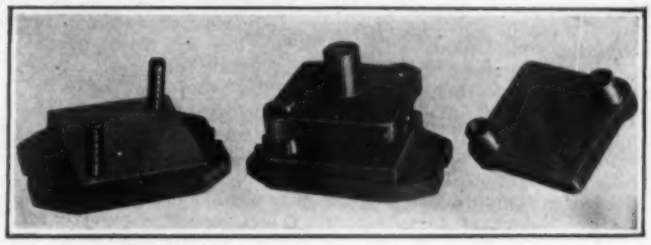


Fig. 2—Punch and die set with steel liner pins and bushings placed diagonally

(f) A sales price that shall meet competition in regard to prime labor and material costs, plus overhead and normal profit of companies that occasionally may be tempted to make their own sets for limited use, as necessity arises.

To offset the cost to the user of an accessory, there must be considered the reduction in cost by minimizing the time factor applied in getting operations under way. The ability to start operations while competitors are only planning merits serious thought. Adopting these possibilities as integral with a planning department, aims at efficiency in obtaining maximum output with minimum outlay, interpreted in the broadest sense.

The standardized items most readily incorporated in a particular die are the punchholder, die shoe, liner pins and liner-pin bushings, when the latter are not an integral part of the punch holder, like boss projections. The other parts, correlated and equally readily standardized, are the punch plate, stripper plate, die blank, connecting screws and dowels. These standardized items invariably remain the same as to shape, size and methods of machining and finishing, except that widely different size products will automatically group themselves in one or the other standard-size die set. Based upon a correct design of the component parts of a standard punch and die set, it is possible to interchangeably perform all the machining operations previous to the laying out of the die opening and the making of the punches.

When the die set has reached this stage, it is ready for conversion from the genus to the species die. The subsequent effort must necessarily be of a special nature and constitutes the departure from the common road, for at this critical point the die is adaptable to the pro-

duction of many varieties of merchandise as to size, kind and shape.

Although a complete understanding and appreciation of the requirements may be had, the availability of a variety of standardized types will more than ordinarily facilitate the work and shorten the interval of determining the selection.

For simplicity in selecting the particular standard punch and die set, certain common references must be available which may be interpreted by all from a common viewpoint. They are as follows:

(a) A table number indicating a particular size set of such strength and proportions as will produce the result sought. The width of the strip from which the punchings are to be blanked is one of the criterions concerning the size of the standard set. Small parts frequently lend themselves to economical grouping for multiple production at each stroke of the press, by similar punches functioning simultaneously with their corresponding die openings. Irregularly shaped parts are frequently produced at an angle other than normal to the natural axes of the piece. The grouping for multiple production and the positioning of the irregular blank are done for economic reasons, such as minimizing the amount of scrap, reduction of expense for stamping small parts with or without a roll feed, proper utility of standard width of stock, utility of press equipment, and so forth.

(b) The type of die set that is preferable to suit the conditions of local use, the punch press operation to be performed and the method of securing the die set to the press also control the choice.

(c) Rear or diagonal liner pins and bushings constitute an important factor in the selection. A standard set in which the die shoe has no slot is readily machined to accommodate a straight side or tapered die blank.

(d) The length of the liner-pin bushings that project below the lower face of the punch holder, determines the travel distance through which there is continuous sliding contact and positive alignment between the punch holder, with its punches, and the die shoe, with its die blank, the openings in which must function with the punches.

(e) The shut height of the die set, taken at the maximum and minimum limits is of vital importance. These limits are determined by the power press which is to perform the production, and into which the set must fit. The shut height is the vertical distance from the bottom of the die shoe to the top surface of the punch-holder flange in the case of the die and, correspondingly, in the case of the press, it is the vertical distance from the bed surface or the top of the bolster plate to the bottom of the ram, with the press adjustment up and the stroke down.

Of the various factors affecting the selection of standard punch and die sets, there is, perhaps, none in which there is such a difference of opinion as in the case of liner pins and liner-pin bushings.

Some concerns employ soft tool-steel pins running in cast-iron bushings or bosses that are an integral part of the punch holder. Others prefer pack hardened and ground machine-steel liner pins running in cast-iron bushings or bosses of the type just mentioned. Still another group employs both liner pins and liner-pin bushings made from machine steel pack hardened and ground. Of the steel liner-pin type, some prefer oil grooves while others do not.

Since users of the various types are conscientiously convinced of the correctness of their choice as applied to their own manufactured products, it may be of interest to note the advantages and disadvantages as claimed.

In the case of soft tool-steel liner pins and cast-iron liner-pin bushings, integral with the punch holder, there is apparent one main disadvantage, namely, the scoring of both the pin and the bushing when dirt or grit lodges between them and causes a jam during the motion of the press. Eventually, due to continued increased scoring of the pins and bushings, the fit between them is destroyed. This condition can be materially eliminated by the use of felt wipers on the lower ends of the bushings, so placed as to act similarly to the packing of a stuffing-box gland. Another disadvantage is the wear of both the pins and bushings that will develop to an appreciable amount when used on presses operating at a high speed and on large quantity production. However, when employed in industries where the production of a given unit is small and such as to necessitate frequent changes from the original design, this type of pins and bushings is employed to a great extent.

In the case of pack hardened and ground machine-steel liner pins and cast-iron liner-pin bushings, integral with the punch holder, there is a possibility of dirt and grit lodging between the pin and the bushing but, in this case, only the bushings will become noticeably scored, while the pins will remain comparatively free from the score marks. With the exception of those who are strong adherents to the steel type of pins and bushings, this second type of construction appears most popular. It affords very good results on certain classes of work where a medium quantity production is desired.

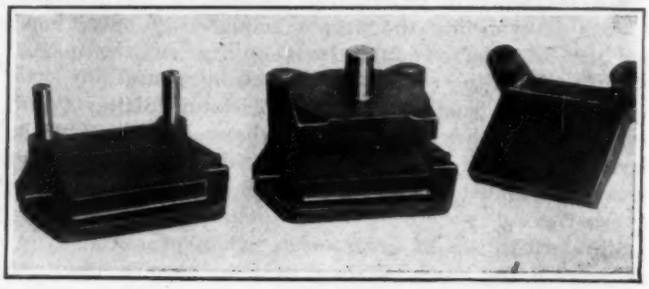


Fig. 3—Punch and die set with steel liner pins. Bosses cast on punch holder are used in place of inserted bushings for liner pins

In the case of pack hardened and ground machine-steel liner pins and liner-pin bushings, there are certain disadvantages claimed. If the pins and bushings freeze together, either may be pulled out of their bearing supports. Another objection claimed is that of greater cost. This type of construction has the advantage of remaining in alignment under most disadvantageous operating conditions. Die sets of this type are employed for high quantity production.

There are several and distinct advantages that accrue to the user of standard punch and die sets, which may be enumerated as follows:

The designing time and the corresponding expense are reduced.

The checking of standard parts for strength and durability is eliminated.

The designer and the toolmaker need only consider the operations affecting the layout of the die proper.

The standard parts of the completed die are less expensive and the finished die is more promptly available.

No time is lost awaiting patterns and castings.

Uniform die parts facilitate the conversion of standard sets into finished dies.

Standard sets are ready to complete in the toolroom as per the piece-part requirements.

An early set-up affords a competitive advantage in planning, quoting, producing or delivering the finished product.

Well seasoned parts eliminate inaccuracies of distortion, otherwise occasioned by time.

Uniformity of general design saves time and expense by quick, orderly storage.

By consideration of all sizes and types of standard punch presses, standard sets are promptly accommodated by such presses.

The most important feature of construction governing the finally successful operation of a die, is its positive alignment-relation between the punch parts and the corresponding openings in the die block and the maintenance of this relation throughout its productive life.

Liner pins and liner-pin bushings accomplish this by the following conditions:

(1st) Their security in the die shoe and punch holder, respectively, by means of a pressed fit.

(2nd) The use of machinery steel, carbonized, for bushings, as well as for liner pins, develops the advantage of a resilient core with the resistance of a hardened functioning surface.

(3rd) There is maintained perpendicularity between the axes of the pins and the bushings with respect to the top surface of the die shoe and the lower surface of the punch holder. This condition should not vary by more than 0.001 in. in 6 inches.

(4th) Through a well known feature of design, the prevention of reversal of the punch by a novice using a diagonal liner-pin type is accomplished by having one liner pin, with its corresponding bushing hole, slightly smaller in diameter than the other.

(5th) Through generous proportions, by means of extra long bushings, their contact with the liner pins is assured during all stages of operation. The several parts of the die set must resist the stresses developed during the performance of the press in producing the various sizes, shapes and thicknesses of stampings for which the die is designed. Independent of theoretical proportions, there is a common-sense idea concerning the dimensions of the various parts and also the practical adaptation of the standard punch and die set to the various makes of punch presses.

There is shown in Fig. 1, a standard punch and die set of the rear liner-pin type, with steel liner pins and liner-pin bushings, showing the appearance of the assembled and the dismantled unit.

A similar construction to that just described can be realized by replacing the rear liner pins and liner-pin bushings by pins and bushings located in diagonally opposite corners of the die shoe and punch holder respectively.

In Fig. 2 is shown an assembled and dismantled standard punch and die set of the diagonal liner-pin type.

The use of available tables and mechanical layouts for rear and diagonal styles having steel bushings or integrally-cast bushings will permit the diemaker to anticipate his own work on the set at the time he orders it, so that he may prepare the parts of his own making and know that they will interchangeably fit the set upon its arrival.

Reference has already been made to the diversity of opinion regarding the wearing qualities and comparative degree of accuracy between separate steel bushings and bushings cast integrally with the punch holder. Fig. 3 shows a standard punch and die set having steel liner pins driven into the die shoe and integral cast-iron bushings or bosses as part of the punch holder.

Further standardization of the component parts of a die can be accomplished by incorporating standard die blanks, stripper plates, punch plates, screws and dowels.

Die blanks may be standardized by the selection of such sizes as have been required most frequently in dies employed for the manufacture of a particular product comprising a number of parts.

Motor Shop Problems

New Designs and Production

By Frank C. Hudson

THE production man in the automobile shop is having troubles of his own this season. First came four wheel brakes and then balloon tires to upset his production schedule by necessitating new tools and fixtures and adding to costs. For even the simple hydraulic brake makes some changes in the mechanism, while the various types of mechanical brakes add numerous operations both to the front axle and the necessary connections. And balloon tires make it decidedly advisable to change the ratio of the steering gear to make the car steer as easily as one equipped with high-pressure tires. All these things add to the troubles of the production men, especially as most automobile manufacturers still use one or the other improvement as optional equipment, which means carrying two lines through the shop at the same time.

Then after getting well set on the new line with schedules that required pushing every department to the limit, along came orders to cut production from 25 to 75 per cent. The grief of trying to keep costs down under such conditions has added a flock of gray hairs to the head pieces of production men all through the industry. And the end is not yet.

The battle for supremacy, which really means survival, is developing new devices that are being announced in season and out, mostly the latter. New models, bearing the premature label of 1925 are being announced with all sorts of improvements. Adjustable piston-pin bearings; oil refiners which eliminate the dilution of the crankcase lubricant; new methods of chassis lubrication from a single point; new transmission units and other devices are making this a very confusing and trying year for the production man.

This is a customer's year. Instead of taking what he can get and perhaps waiting a month for it, he can drive home in almost any car and come very near getting what he wants in the way of equipment, new devices and frills of various kinds. It will all work out to the ultimate good of the industry and the public, but for the present the production man is the goat and deserves sympathy and consideration.

Production costs cannot be kept down to bed rock where changes are being constantly made and schedules cut in half, and management must make due allowances for what may seem unnecessary increases in unit costs. The production man is on his job in most cases and will make good when he has half a chance.

All of the changes referred to may not stand the test of actual service, but some of them are sure to be found standard equipment in the near future. The situation confounds both those who advocate a standardized car with no changes for a period of years and those who oppose S.A.E. standardization because it prevents improvement. Standardizing parts used in construction seems to be on firm ground. For nearly all the devices can use standard bolts, nuts, steels and heat treatment without in any way impairing the development of vehicles from time to time. The great problem seems to be to determine the improvement which should go on cars of different classes and for different uses. Also to plan these changes so as not to interfere too seriously with production schedules for the year. Above all, keep the production man informed as far ahead as possible, of any pending changes, either as to a new design or changes in quantity schedule.

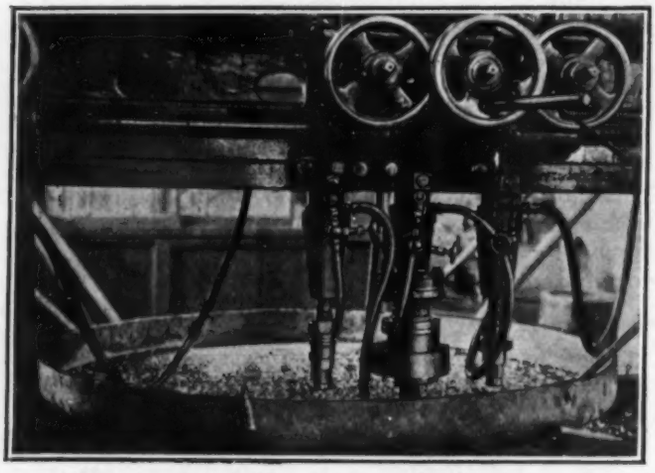
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Flue-Sheet Boring and Reaming Tools

BY HENRY M. CLARY

The photograph herewith shows how holes in front flue sheets are bored and reamed in the M. K. & T. shops, Parsons, Kans. Three spindles of a Niles-Bement-Pond 4-spindle rail-drill are used to do the



Flue-sheet boring and reaming tools

job and the tools are two 2$\frac{7}{16}$-in. boring tools for the 2-in. flue holes and a 4$\frac{13}{16}$-in. trepanning tool for the superheater flue holes. Each of the smaller tools carries a double-end cutter for countersinking, as shown. The smaller tools run at a speed of 96 r.p.m. and the trepanning tool runs at a speed of 76 r.p.m., compound being used as a coolant. The sheet shown in the illustration is smaller than the average, but an average sheet, which has 500 flue holes, or a fire-box sheet with 197 small holes and 34 superheater flue holes can be bored in six hours.

Making Spindles for Machine Tools—Discussion

BY MILTON WRIGHT

The article under the title given above by S. W. Brown, page 939, vol. 60, of the *American Machinist* attracted my attention particularly because I have made several such spindles and many collets myself. I have no criticism upon Mr. Brown's method of finishing collets—I make 'em that way myself—but in handling long, heavy spindles he is taking chances.

In the first place, truing the extending test-bar over its whole length by manipulating the jaws of the chuck, in which is held the small end of the spindle, is much easier to write about than to do; and Mr. Brown didn't say what he was going to hold the indicator in while his carriage was between the chuck and the steady-rest. Further, if the finished taper-hole was even a little bit "out," it would require considerable set-over of the small end of the spindle to compensate for it, and the angular presentation of the spindle to the chuck would have a tendency to cause it to work loose in the jaws or, at least, to change its position.

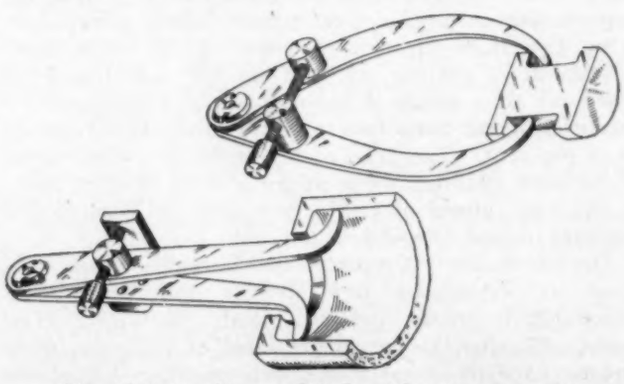
According to my notion a much easier, not to say surer, way is to machine the spindle down to a very close finish allowance and then, instead of reaming from a parallel or step-drilled hole, *bore* the taper almost to finish size by means of a small boring tool held in the compound rest. The reamer cannot get very far from a truly central position if it has but a thousandth or two on a side to scrape off. With our modern facilities in the way of high-speed toolpost grinders we could even grind the hole to size and leave the taper reamer out of the question altogether.

If the spindle is to be heat-treated in any way the latter method of finishing the taper hole is by far the best, boring the hole before hardening and grinding it afterward. No amount of straightening will ever make a sprung spindle as straight as it was before hardening, and if any spindle that has been straightened after hardening remained straight for long after it was put into service I have never met it.

Substitute for Lock-Joint Calipers

BY G. A. LUERS

To gage the diameter of a recess, either inside or out, by means of the ordinary firm-joint caliper is not an easy thing to do, for, though the tool may be set readily enough to the size, it cannot be removed from the work for the purpose of measuring the distance between the points without disturbing the setting. The sketches show simple additions that can easily and quickly be applied to firm-joint calipers by any mechanic, and that will convert them into serviceable tools having the features of the lock-joint.



Firm-joint calipers fitted with stop screws

For the outside caliper it is necessary only to set a stud in each leg, with an adjusting screw tapped through one stud in such position that its point may bear against the stud in the opposite leg. The plain stud may be riveted in place, but the stud holding the screw must be made to swivel; otherwise the screw will point in the right direction in only one position.

For the inside caliper the screw stud is made in the same way, but for the fixed stud is substituted an L-shaped stop piece; which also must be made to swivel.

Rope Capacity of Drums—Discussion

By Hyman Levine

The actual amount of rope that can be wound on any given drum varies with so many factors that it is difficult to derive a formula that will fit all conditions. The length of rope will be affected by variations in diameter, the use that the rope has received, the weight at the end of the rope, the distance of the load from the drum, the angle at which the load is being moved, the speed of the drum, and other elements. The best that one can do is to develop a comparatively simple formula, based on an assumption of perfect conditions, and then allow a margin of safety for the varying conditions encountered.

The formula developed by the writer is based on the assumption that each layer of rope occupies the grooves formed by the strands in the preceding layer, and is stated as follows:

$$L = \frac{TMNn}{12} = \frac{T}{12}\left(\frac{D+d}{2}\right)\left(\frac{D-d}{1.732R}\right)\left(\frac{W-R}{R}\right) = 0.0756\,\frac{(D^2-d^2)\,(W-R)}{R^2}$$

where

L = Rope capacity of drum in feet;

M = Mean dia. of rope, in inches = $\frac{D+d}{2}$

N = No. of layers = $\frac{D-d}{1.732R}$

n = No. of coils per layer = $\frac{W-R}{R}$

D = Dia. of flange, in inches;

d = Dia. of drum, in inches;

W = Width of drum, in inches;

R = Dia. of rope, in inches.

To prove this formula a drum used on a popular make of air-operated hoist was selected. A preliminary test was made with ⅜-in. wire rope to observe the form that the rope assumes in winding. It was found that the rope makes almost a complete revolution in a circular path, then kinks over sharply for a short distance to start the next coil. This holds true on the first as well as on succeeding layers. All succeeding layers after the first wind into the grooves formed by preceding layers, each coil making a comparatively sharp jump from one groove to the next. In making this jump it necessarily crosses an adjacent coil, thus increasing the diameter of the coil at that point.

After the preliminary test, the drum was wound with a new piece of ⅜-in. wire rope up to the point where the flange begins to flare off. During the winding the rope was held taut by a 200-lb. weight attached to the end and was guided by a steel bar to keep the coils close together. The actual length of rope wound on the drum to the end of the tenth layer was 299 ft. 2 inches.

The dimensions of the drum for substitution in the formula were, $D = 11\frac{3}{4}$ in.; $d = 6\frac{1}{2}$ in.; $W = 4\frac{3}{4}$ in.; $R = \frac{3}{8}$ in. (nominal), 0.324 in. (actual). Using the actual diameter of the rope and substituting the given values in the formula for L, the following result is obtained:

$$L = \frac{0.0756\,(11.75^2 - 6.5^2)\,(4.718 - 0.324)}{0.324^2} = 303 \text{ ft.}$$

This result is about 1¼ per cent greater than the actual amount wound on the drum.

A formula derived by Henry C. Ord on page 961, Vol. 59, of the *American Machinist* gives the length of rope as follows:

$$L = \frac{0.06545}{R^2}\,(W - R)\,(D^2 - d^2)$$

Substituting the numerical values

$$L = \frac{0.06545}{0.324^2}\,(4.718 - 0.324)\,(11.75^2 - 6.5^2) =$$

261.2 ft., and the amount of rope shown by the formula is 38 ft., or 12½ per cent, less than the actual amount.

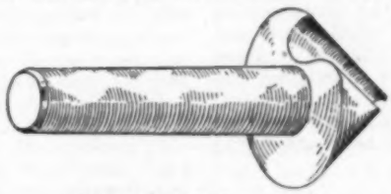
A comparison of the actual with the computed results shows that the number of coils per layer is slightly larger than indicated by the writer's formula, due to the winding of the rope in circular rather than helical form; and that the number of layers is slightly less than that indicated by the formula, due to the crossing of the rope from one groove to another. The total length of rope actually wound on the drum, however, is within 1¼ per cent of that computed by the writer's formula, and the formula is sufficiently accurate for practical purposes.

A Countersink for Wood

By Frank L. Young

The sketch shows a countersink for wood that is easy to make, presents the sharp cutting edge with ample top rake so necessary to make a clean cut in that material, and that will not tear the stock, even in soft wood.

After turning the countersink to shape in a lathe it is set up in a vise with one of the angular faces parallel with the vise-jaw and a hole drilled parallel with the face. It can be held in the vise in this way by placing a round rod under the shoulder on one side, with a piece of soft metal between the angular face and the vise-jaw on the other side. The rod allows the angular face to align itself with the vise-jaw and equalizes the pressure.



Countersink for wood

A drill that is small enough to remain entirely within the metal of the tool is first used to drill the hole through and, without disturbing the setting, is followed by a larger drill that will cut out into the soft metal clamping piece.

After drilling the hole the surplus metal opposite the cutting edge should be removed with a file and the tool backed off slightly all the way around. The more clearance that is given in this way, the faster the tool will cut. With slight clearance the tool will cut surprisingly well and will leave a smooth, burnished surface on the wood.

Technical Abstracts

Modification of Oil Tempering Bath Makes It a Success

Description with illustration is given of standard equipment consisting of a heat insulated rectangular oil tank of about 50 gal. capacity, having at bottom a steel sheathed nichrome wire heating element consisting of five sections each of 5 kw. capacity, connected so as to maintain a temperature of 690-710 deg. F. automatically. In actual practice this proved unsatisfactory, and a description, with illustrations, follows of changes made to produce a satisfactory equipment.

Investigation proved that the difficulties were due to inherent characteristics of oil as regards convection and conduction of heat, both of which are of a low order. Consequently, while the upper layer of oil was maintained at 700 deg. F., the temperature at the heating element reached 2,000 deg. F. By enclosing the heating element in a heat-insulated cylindrical tank, piping this to the tempering bath and circulating the oil by means of an oil pump, a completely successful equipment was designed.—*Fuels and Furnaces*, July, p. 647.

Stainless Steel Ball Bearings

A paper by Axel Hultgren, chief metallurgist of a company in Gothenburg, Sweden, was contributed to the American Society for Testing Materials, entitled "The Carrying Capacity of Ball Bearings made of Stainless Steel." A comparison was made of balls made of low chromium steels of American, British, and Swedish production. The hope of the investigation was a solution of the problem of rust resisting ball bearings. The results are announced as far from promising, the carrying capacity of the stainless steel bearing being only 10-20 per cent of that of ordinary ball bearings.—*Iron Age*, July 3, p. 12.

Magnetic Method of Determining the Endurance Strength of Iron and Steel

Commandant L. Fraichet of the French Department of Military Aeronautics describes a magnetic method for determining the endurance strength of iron and steel. The test piece is pulled in an ordinary tensile testing machine, but is surrounded by an electric magnetizing coil and by a winding making possible the measurement of the magnetization. It appears that the magnetization registers permanent molecular changes much more sensitively than the ordinary stress-strain diagram. In the case of hard steel there is no drop of the beam indicating the yield point, and the point of beginning deviation of the stress-strain curve from the straight line is hard to determine. The author points out that it may not give the real limit of elasticity anyway. The magnetization shows a sharp break in some cases much below the conventionally determined elastic, or rather proportional elastic limit, indicating that a permanent molecular change has taken place. This corresponds to the fatigue strength of the material. On this basis the author maintains that a certain alloy steel of 140,000 pounds conventional elastic limit, a steel much used for airplane crank shafts, is in fact much more subject to fatigue breakdown, than a certain other steel having an apparent elastic limit of only 110,000 pounds per square inch.—*Le Genie Civil*, May 24, p. 495.

Trade in the Baltic States

The Russian situation continues to rob the Baltic states of possibilities of commercial progress. In Esthonia and Latvia the boom after the war has been followed by a great business depression, which has now been made worse by poor harvests. The countries are in need of machinery and other things, but require very liberal credit conditions. Such seem to be offered for instance by Sweden.

Germany was before the war by far the most prominent purveyor to the Baltic States, and continued to be so after the war, because the monetary debacle made it possible for Germany to undersell all competitors. At present, however, the stabilization has made German wares rather more expensive than those of other countries, and German trade is receding.

In Finland the financial situation has in general been excellently handled by the government. There has been a poor harvest but the effects even of this are disappearing and the buying power of the public is considerable. The country has, however, some established industries and is trying to establish others. Some of these—the shoe and leather industries particularly, are clamoring for protection, but this the government has so far refused to grant. It has, however, put a tax of 1,000 f m k (about $30) a month on foreign traveling salesmen—if to any good purpose is uncertain. The greatest import is machinery, and here Germany has as much as four-folded its pre-war exports to the country. America seems mainly to supply grain. It is pointed out that the Finnish business man as a rule is conservative and sticks to forms he has dealt with for a long time.—*Die Werkzeugmaschine*, May 15, p. 175.

Scientific Management at the Holt Tractor Plant

George D. Babcock of the Holt Manufactring Co. discusses the changes in equipment and product preceding installation of production control. In considering these changes necessary to build tractors under scientific management Mr. Babcock relates that a requirement was laid down that no material should issue from the storeroom except upon presentation of requisitions or store issue slips authorized by a material control division, previously established. This sounds like a simple demand but proved to be extremely difficult since the personnel at first available was quite unable to grasp the fundamentals of storekeeping. It was not until J. C. Murphy, who had been with the material control department at the Franklin plant was put in charge of this work that anything like control of the material department was obtained.

A more complex job was undertaken in studying the best way to machine the several thousand parts entering into the construction of tractors and in designing the tools and fixtures best suited to do the work. In order to fix the time in which such work should be done, it was necessary to specify the best combinations for speeds and feeds. A survey of all the machines in the shop had first to be made in order to learn whether or not the best combinations were available in all machines in use. When the routing was finally decided the shop had to be rearranged, and a close approach was made to the ideal arrangement of having raw materials enter at one end and progress in a straight line to the point of assembly.

A metallurgical laboratory was established, which by working in conjunction with the engineering department reduced the varieties of steel and other materials used in the factory. Investigation showed that there was often one steel whose properties were such that it could be substituted for many others.

As regards inspection, the first piece in each lot was inspected at the beginning of each operation on the piece. The complete lots were later inspected in a department properly equipped with gages, templets and measuring instruments.—*Management and Administration*, July, p. 19.

Hardwood Conservation by Ford

Details and diagrams are given of the Ford method of laying out body parts for direct sawing from unedged plank. This has led to a tremendous saving in lumber.—*Auto Body*, May, p. 190.

Modern Transmission Design

P. M. Heldt gives valuable data on present-day transmission gearing. Curves are given showing the average value of shaft center distance for transmission of different torque capacities. A 4½-in. center distance on trucks is found to be the average for an engine turning approximately at 170 ft.-lb. torque, whereas passenger cars are somewhat more compact and 3¾ in. is ample for 145 ft.-lb. Transmissions are rated usually in terms of the absolute maximum of the engine torque, which is about 20 per cent greater than that at the speed of maximum output.

Two different classes of steels are used, one of low carbon alloy case hardened steel, the other a medium carbon alloy oil hardening steel. The case hardening steel seems to have been gaining gradually in popularity, but there has been a slight reversion lately in favor of the oil hardening steel, because this steel distorts less in hardening than does the other. The most popular hardening steel seems to be the S.A.E. No. 2320 and of the oil hardening steels three are used, the S.A.E. 2345, 3½ per cent nickel steel, the S.A.E. 3250, a chrome nickel steel and S.A.E. 5150, a chromium steel.

Pitch line velocities range from 1,000 to 2,000 ft.p.m. The working stress in the teeth of the constant mesh pinion, as determined by means of the Lewis formula, varies from 22,000 to 38,000 lb. per sq.in. under full load conditions. The low stresses go together with low pitch line velocities and the high with high tensile oil hardening steels. In the teeth of the low speed pinion on the countershaft the working stresses vary from 38,000 to 66,000 lb. per sq.in. Pitch line velocities of low speed gears at the engine speed of maximum hp. range from 600 to 1,200 ft. per minute.

There has been a tendency to decrease the pitch of the gears in transmissions, and 7-9 pitch teeth are now used in many of the smaller, as well as in some of the larger gearsets. The Gray car has the smallest set regularly produced, an 8-10 pitch being used. The chief advantage of the use of the finer pitch is stated to be more nearly silent operation.

With this article goes a series of articles dealing with automatic and continuously variable transmissions. These are described very fully and the various calculations that enter into them are taken up mathematically in detail.

The transmission was originally developed in 1900 and was actually used in contest by the American Automobile Club of America in 1903-04. There is a valuable description of many patented transmissions which may be of interest here. One by L. M. Dieterich of Hartford in 1900, one by Fischer and Otto in 1901 (patent applied for in 1896), one by W. L. Judson of Chicago in 1901, one by Nathan White of Pasadena, Calif., in 1902, one by W. and G. F. Meischke-Smith of Paris in 1907, one by H. E. Williams of Portsmouth, Eng., one by H. W. Fellows of Los Angeles, one by Paul Weeks of Los Angeles in 1906, one by John Reece of Manchester, Mass., in 1915, one by Georges L'Hermitte of Nantes, France, in 1922, one by Carl W. Weiss of New York in 1915 and finally one by Daniel W. Driscoll of New York in 1923.

There is also a very good description of the inertia mass type transmission such as developed by Mr. Constantinesco and Wilfred Hunt. These are described and explained very fully.

There is also an article on page 18 dealing with transmission weight reduction in which it is stated that the Oakland reduced its gear box weight from 72 to 50 lb. this year particularly by reducing the gears from 6-8 pitch to 7-9 pitch.

With this article go descriptions of the Gray transmission, the Chandler Traffic, the Chevrolet, the Muncie Model T-5, Peck, Covert Model E-3-B and Mechanics Model J.—*Automotive Industries*, July 3, p. 2.

Producing Hardened and Ground Rolls

J. R. Adams, Superintendent, Research Department, Midvale Co., presented this paper at the Meeting of the American Iron and Steel Institute on May 23rd.

It deals in splendid detail with the complete manufacture of rolls. The composition of these falls within the following specifications:

Carbon	0.170 to 1.25 per cent
Manganese	0.20 to 0.40 per cent
Silicon	0.15 to 0.30 per cent
Chromium	1.50 to 2.50 per cent

After annealing, the forgings are rough machined in a heavy duty lathe and an axial hole bored through the center of the rolls to examine the interior for defects by means of a bore searcher. Machine surfaces should not be rough, lest the efficiency of the subsequent heat treatment be diminished.

The hardening of a large mass is not an easy matter, and when it becomes a roll 24 in. in diameter by 46 in. long, the difficulties are great. Hardening is carried out in various ways by different manufacturers, by a water dip, by water spray or by submerged spray. The largest rolls are difficult to quench in a spray with consistent success, but H. A. Brustlein of France noticed that some of the hardness of chrome steel is sacrificed if rolls are not quenched in a spray. Difficulty in hardening is sometimes encountered due to the design of the rolls. Sharp angles and tapped holes add to the risk in hardening.

After hardening and relieving the strains, the scleroscopic hardness is determined for every inch on paths running the full length of the body. If the scleroscope shows non-uniformity or lack of proper hardness, the roll is softened and rehardened. Scleroscopic readings should be rigidly standardized.

Grinding must be done very carefully as the value of previous operations may be ruined unless lighter cuts are done with the proper wheels. Coarse, soft, free-cutting wheels should be used for rough grinding, and finishing should be done with slightly harder wheels and lighter cuts. If too heavy cuts are done with a fine, hard wheel, small hairline cracks and pits are developed. Rolls are furnished with what is called a silver mirror finish, and after grinding, are slushed to prevent rusting.

Before starting to roll, it is generally considered good practice to heat rolls slowly to the temperature they will reach in operation, thus preventing localized heating. High speed steel is being tried out and is of advantage for some types of rolls, but there are considerable difficulties in hardening large pieces so that probably its use will be confined to the smaller rolls.—*Abrasive Industry*, July, p. 168.

Rowntree Profit Sharing Idea

B. S. Rowntree is head of one of the largest cocoa making businesses in England, and is recognized as a leader in industrial welfare matters.

In this brief article he lays down ten points about his plan in which capital is paid a standard wage of 7½ per cent. Adequate sums are set aside for equalization of dividends. Directors can put sums to advertising reserve not in excess of 10 per cent of the capital.

All these reserves are brought back into a pool and divided among those entitled to share in surplus profits, which are divided between capital 40 per cent, management 10 per cent and labor 50 per cent.

Labor shares and profits are paid into a bank and are withdrawable at once in cash. A strike authorized by a union shall not be regarded as a breach of employment for the purposes of the plan.

This firm is probably among the most radically inclined in Great Britain, so the article is well worth studying.—*System*, July, p. 45.

Car Wheel Foundry Straight Line Conveyor

The National Car Wheel Company of Rochester, N. Y. uses this straight line conveyor, having a capacity of 400 wheels in eight hours, to handle all molding operations for the manufacture of chilled iron car wheels. The features of this molding unit differentiating it from similar units elsewhere are first of all the compactness, then the elevated shake-out grate and finally the gravity conveyors for carrying the cope and drag flasks back to the molding end of the unit. Straight line conveyors are used so that turntables and transfers are avoided. On one side is a mold conveyor and in parallel line in the order named is gravity return conveyor for the drag flasks, a conveyor for sand and three gravity return conveyors for the cope flasks. With this arrangement there is a constant stream going in two directions, the finished molds moving down the mold conveyor and the empty flasks and molding sand returning in the opposite direction.

Details of the system are described and illustrated and there is also a plan and sectional elevation of the equipment.—*The Iron Age*, July 10, p. 67.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Railroads Must Keep Their Friends

ADEQUATE freight rates are vital to the continued existence of any railroad. Many roads consider themselves lucky to break even on their passenger business and look upon it as a necessary evil that must be put up with in order to secure the lucrative freight business.

The manufacturing and other industrial interests of the country have generally recognized their own dependence on efficient transportation systems and have been willing that those who conduct the railroads should receive a fair return for the service they render. At times when the railroads have had to defend themselves against demagogues who want to lower rates and raise wages simultaneously, they have had the support of industry.

Statistics show that the railroads as a group are among the largest customers of manufacturers of machinery, tools, shop equipment, etc. As a consequence of the amount of their purchases, they must naturally do business with a great many different firms and corporations and thus have it in their power to make or lose a host of influential friends by the policy they adopt in their business dealings with those from whom they purchase.

Of late there is coming to be a feeling among these men who sell things to the railroads that the methods of buying employed by some railroad purchasing agents, agents of big lines as well as those of little ones, are decidedly unethical, to use a polite expression. They feel that they are quite as much entitled to make a living as are the railroads and they resent the endeavors of railroad purchasing agents to play one manufacturer against another to secure equipment and supplies at less than the cost of manufacture.

No one would be so foolish as to level such an accusation against all railroad purchasing agents. The majority of them are quite as ethical in their dealings as are business men in any line. But if even a few are guilty of questionable buying practice what is going to be the effect upon those who have always been considered the best friends of the railroads?

Isn't it worth the while of every railroad president to check up on his purchasing department to prevent driving the manufacturers into the ranks of the railroad-baiters?

A Warning to Public-Spirited Citizens

A WASHINGTON note says that the case against the former director of sales of the War Department, charging conspiracy in sales of lumber, has been thrown out of court by the presiding justice. After hearing the evidence submitted by one of the ornaments of our sadly degenerate Department of Justice, the judge, without waiting for the offering of any defense, declared that no sane man could find anything culpable in what had occurred but that it was clearly proved that the former director had acted always for the best interests of the government. He further remarked that no attempt had been made to show that the defendant had profited personally in any way.

This is the second indictment against which a former official of the government has had to defend himself as best he could with his own private means. If no other evidence of incompetence than these two cases had been brought against the former attorney-general, there would have been ample cause to dispense with his services.

In the two cases mentioned there is apparently only one victim, the defendant who has had to spend his good money to protect himself from baseless charges brought against him by the very government he sacrificed much to serve. Actually, the damage is much more serious. When the next emergency arises many a capable citizen will think twice before accepting a government office that will place him in a position where he can be attacked with impunity. At such a time there are far too few men of ability who are willing to forget their own interests and undertake national service. With such an example before them there will be even fewer.

Just Suppose

JUST suppose that the manager of a dry goods store makes up his mind that it is a good deal easier to sell the same kind of stuff he sold last year than to bother with newer styles and patterns. In that way, he reasons, he is not going to have a lot of left-overs, he is reasonably sure that he can buy the old goods at a better price than the new ones, and he will have all kinds of other advantages.

How long do you think this dry goods store would stay on Main Street?

Now suppose that Mr. Machine Tool Builder makes up his mind that it is a good deal easier for him to keep on building and selling his present style machine tools than to design new ones and try to market them. He feels that in this way he will get rid of all the bother of designing with its attendant possibilities of mistakes and its high cost of patterns, jigs and whatnots; and as his people were pretty well satisfied with the old product last year, why shouldn't they be satisfield with it this year?

How long do you think it will be before one of his competitors steals a march on him and makes him a permanent member of the Club of Has-Beens?

Well, you say, but a machine tool factory is not a dry goods store!

No, but

Just suppose!

For the Foreman

IT IS a good thing to have the box with spoiled work in plain sight; but it is not necessary to take the man who spoiled it and rub his nose against it.

Swearing and scolding is easier than plain instructing, but does not have the same educational value.

Shop Equipment News

No. 3 Osterholm Automatic Grinder

To finish economically bulky parts of thin section which have been difficult to handle by other means, Williams, White & Co., Moline, Ill., have brought out the No. 3 Osterholm automatic rotary surface grinder. It is particularly suited for such automotive parts as transmission case and timing gear case covers and bell housings and will rotate pieces up to 24 in. in diameter and 10 in. in height.

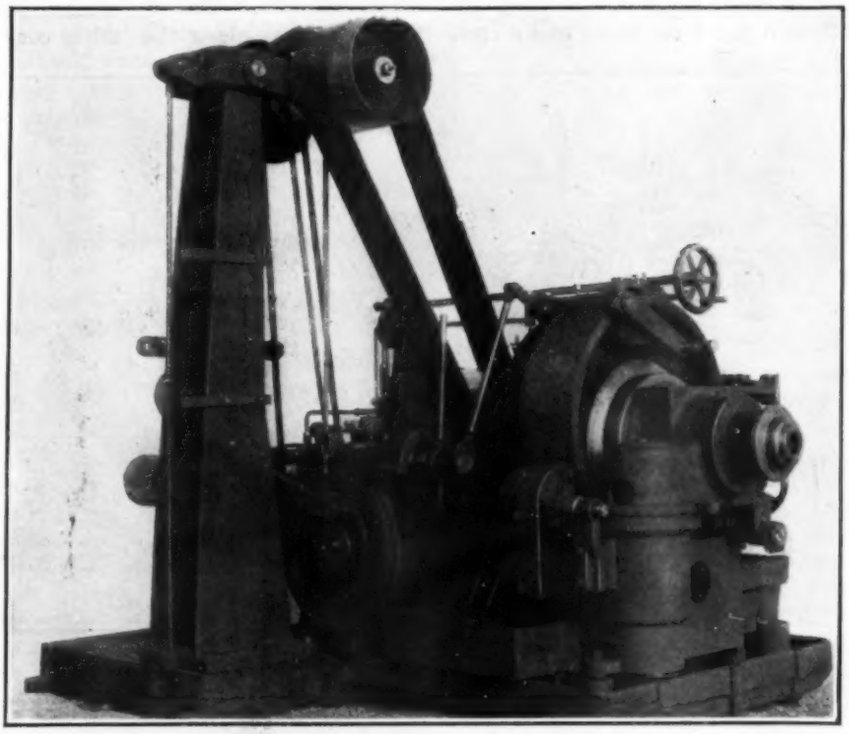


Fig. 1—No. 3 Osterholm Rotary Surface Grinder

The plain Osterholm automatic surface grinder and the duplex rotary grinder were described in detail in the *American Machinist* for June 21, 1923. Many of the unique features of these two machines are incorporated in this single spindle rotary machine which is intended to be practically automatic in every operation except the actual loading and unloading.

The compactness of the design of the single spindle rotary grinder is apparent from Fig. 1. The arrangement with the motor base and columns supporting the countershaft makes the unit practically self-contained. Fig. 2 shows the work-carrying spindle swung back on a vertical axis to loading position perpendicular to the face of the wheel. With the work securely clamped in position, the operator swings the work-carrying spindle housing into the operating position. The housing is locked in this position by a mechanism similar to the breech lock used on large field guns. The engagement of a single lever starts the machine on an automatic cycle. The work-carrying spindle is rotated, the feed of the wheel towards the work is applied, and the coolant is automatically applied through the spindle carrying the abrasive wheel. After the required amount of stock has been removed, the feed automatically ceases and the work head comes to a stop. The work-carrying spindle is unlocked and returned to loading position by a single pull on the part of the operator.

The work-carrying spindle is supported by thrust and annular ball bearings. Spring buffers are provided at each end of the 90 deg. motion of the work spindle housing so that the weight of this part of the mechanism is cushioned at both ends of its rotation. Steel buttons are provided, assuring positive alignment of the work-carrying spindle with relation to the grinding wheel when locked in its operating position.

Change gears mounted on the left hand side of the grinder make it possible to adjust the speed of the work head to the requirements of the piece to be ground. The driving mechanism for the work-carrying spindle is entirely enclosed and flooded with oil.

A cylinder wheel 20 in. in diameter, 2-in. rim and 6 in. high is mounted in the wheel chuck. The spindle, which is made hollow for the accommodation of the coolant supply pipe, is carried in two babbitt bearings driven by a 10-in. belt at 900 to 1,000 r.p.m., a maximum of 30 hp. being required. The reaction or thrust of the wheel is taken on a ball thrust bearing. The means for adjusting the end play of the spindle is located at the rear of the spindle bearing. Both spindle bearings are lubricated by chains that dip into oil reservoirs.

The spindle head is mounted on a slide and located by a screw and handwheel adjustment. The ad-

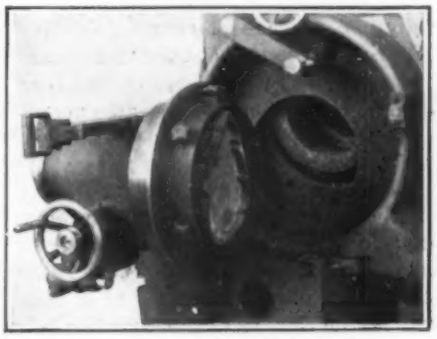


Fig. 2—Osterholm grinder open for loading

justment is used in production work merely to locate the wheel and adjust for wheel wear. The outboard end of the adjusting screw is threaded into a pedestal operated by a single tooth rack, which in turn is actuated by a feed cam to form the power feed. The sector which advances the rack is located on the cross shaft at the back of the machine. This cross shaft carries a large cam lever with an intermediate cushioning spring.

A roller at the long end of the cam lever engages with the feed cam which draws the wheel back ⅞ in., during loading, then brings it up into working position and finally establishes a constant rate of feed through any predetermined distance to the finished position. When the finished position is reached, the roller follower rides up the advance side of the cam peak, causing the feed lever to contact with a trip lever which shifts the feed belt to a loose pulley, thereby stopping the rotation of the work-carrying spindle. This belt drives a pulley, which is located on one end of the worm shaft. At the opposite or forward end of this worm shaft is located a set of change gears which transmits a drive to the worm shaft of the worm and gear combination that drives the feed cam shaft. An emergency jaw clutch is installed on the feed worm shaft, being operated by hand lever. When this lever is disengaged, the work carrying spindle continues to rotate but the wheel head ceases to advance. Varying rates of feed may be obtained by changing cams, although the manufacturer has devised an adjustable spiral cam for the same purpose.

Whereas the contour of the feed cam controls the depth of cut for a given operation, the time for a cycle of operations is determined by the ratio of the change gear set. The combinations which have been adopted permit a range of working time that varies from 10 sec. to 2 minutes. Because of the relative lengths or ratio of the feed cam roller lever arm, profiling of the feed cam is a comparatively simple operation and need not be held to micrometric limits.

An unusual feature consists in the method of coolant control and circulation. In the first place, the coolant is introduced through the center of the spindle by means of a long tube which projects through the hollow spindle and directs a stream of coolant against a deflector mounted just inside the cup wheel. The long tube is supported at the rear end by means of a hollow bracket to which the hose supplying the coolant is attached. The front end of the tube is supported in an oilless bearing just within the front end of the spindle. The deflector against which the stream of coolant is directed diverts the stream into the inside of the cup wheel, from which point it cascades across the entire cutting surface as a result of centrifugal force.

To facilitate loading, the supply of coolant is cut off by a selective valve operated by a lever mounted on the shaft at the rear of the machine. During the loading of the machine, the coolant stream is automatically diverted into the slush pans.

Besly Special Double-Spindle Grinder

Charles H. Besly & Co., 118 N. Clinton St., Chicago, Ill., have recently completed a double-spindle, ring-wheel grinding machine, especially adapted for the grinding of the ends of cylindrical valve sleeve parts. In the accompanying illustrations the machine is equipped with a semi-automatic feeding attachment for these parts and a close view of the attachment is shown in Fig. 2.

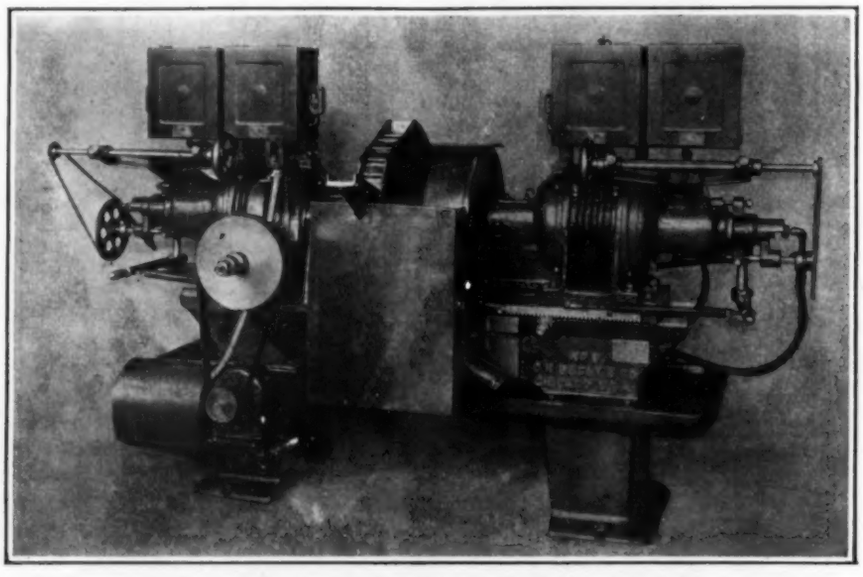


Fig 1—Besly Special Double-Spindle Grinder

The feeding wheel is bushed with hardened bushings that accommodate the pieces to be ground. The work is fed into the chute and is picked up by the feeding wheel which carries it through the guides and between the grinding wheels. The ring-type grinding wheels are attached to chucks mounted on the inner ends of the two opposed spindles, each wheel grinding one end of the work passed between them. The finished parts drop out at the bottom onto a screen chute.

The frame of the machine is designed for wet grinding as it has a large cast-iron water pan between the base and the bed. The main bed casting has machined V-ways on which the bed plates for the motors are arranged to slide. Two 7½-hp. motors drive the wheels and are attached to the bed plates. These motors are specially designed for totally enclosed service, and the rotors are mounted directly on the wheel spindles. The adjustment of the bed plates along the bed is con-

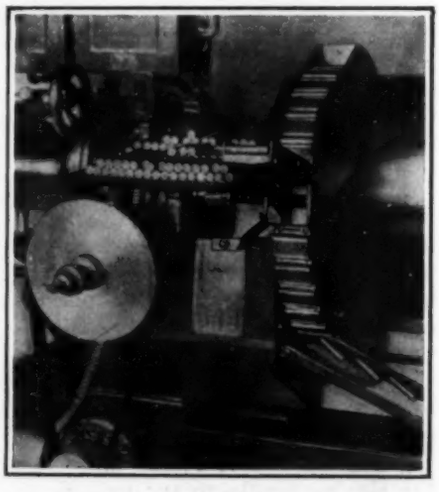


Fig. 2—Close View of Besly Feeding Mechanism

trolled by a rack and pinion and the bed plates are securely clamped in position when properly set.

The spindles are 2½ in. in diameter and are carried in phosphor-bronze, ring-oiled bearings, the end thrust being taken by hardened steel thrust collars. The bearings are arranged to slide endwise in the motor casing through a distance of ¾ in., the outer ends of the bearing bushings having rack teeth which mesh with pinions operated by hand levers. A micrometer adjustment on each spindle is positioned by a hand-wheel at the front of the machine. The spindles are held in position by coiled springs attached to the pinion handles.

The coolant pump is located on the base of the machine under the water pan and is direct-connected to its driving motor. The coolant is pumped from a 30-gallon settling tank through piping to the outer end of the spindles, which are bored throughout their entire length for the passage of the liquid.

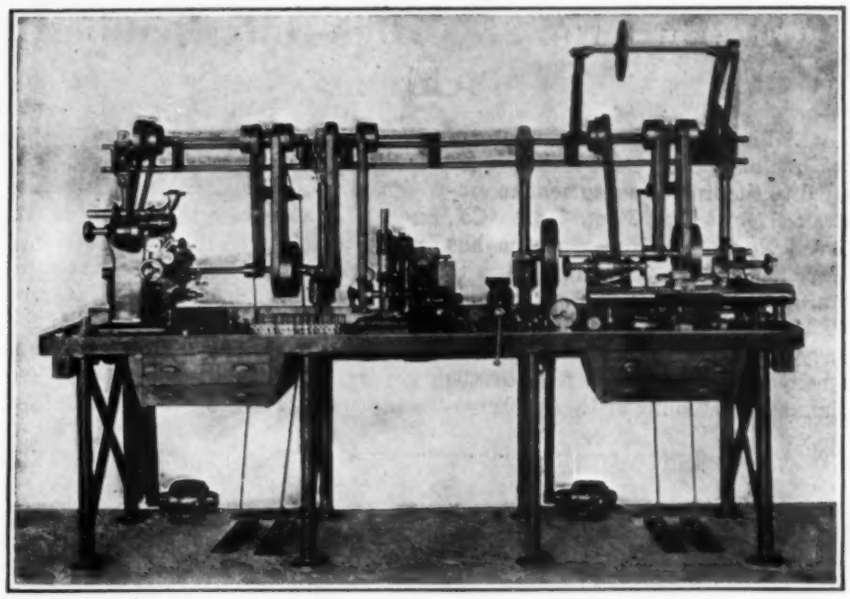
The grinding wheels are of the ring type and are 18 in. in diameter and 4 in. deep, with center holes from 9 to 15 in. in diameter. These wheels are carried in pressed steel chucks secured to the wheel collars of the spindles. A truing device for the wheels is attached to the base of the machine at the rear and is operated by means of an adjusting screw.

The motors are equipped with push-button starters mounted in a row above them. It is said that on gray iron pieces 1⅛ in. in diameter and 2⅞ in. long, when not over 1/32 in. of metal is removed from each end, the work can be held within limits of plus or minus 0.002 in. and ground at the rate of 3,200 pieces per hour.

Pratt & Whitney Complete Bench Tool Equipment

A recent product of the Pratt & Whitney Co., Hartford, Conn., is a complete set of bench tool equipment. This equipment includes a No. 3 universal bench milling machine, a No. 3 bench lathe, a No. 0 Sigourney bench drill, a vise, and the various attachments available with the machines. The tools are mounted on a standard bench and equipped with countershafts and controls.

The bench with the full equipment mounted on it is shown in the accompanying illustration. The milling machine is at the left and the lathe at the right with the drill between them.



Pratt & Whitney Complete Bench Tool Equipment

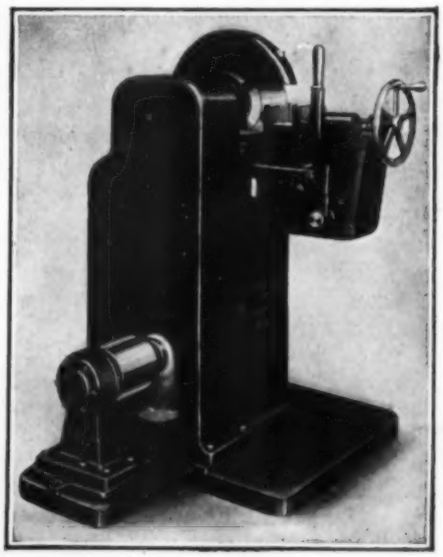
Two ½-hp. motors are placed on the floor and drive the countershafts by belts. Either motor may be operated independently of the other, thus allowing the independent operation of all the units. The milling machine is fully described elsewhere in this issue of the *American Machinist*. The Pratt & Whitney bench lathe and the Sigourney drill are both standard tools. The bench has four drawers for hand tools and other equipment. The countershafting and motor belting are placed at the back of the bench out of the way. The lathe and the milling machine are controlled by means of treadles and the drill has a suitable belt shifter.

Cochrane-Bly High Speed Cutting-Off Machine

A cutting-off machine recently designed and placed on the market by The Cochrane-Bly Co., Rochester, N. Y., is illustrated. The machine is of heavy design and all shafts and spindles are mounted in Timken roller bearings in dust proof cases. Pulleys have solid webs, and are turned all over and balanced.

The wheels or blades used are 16 in. in diameter, and the machine will accommodate an abrasive cut-off disk, a toothed saw or a friction disk. The abrasive wheel is used to cut hardened drill rod, unannealed tool bits, magnet steel, monel metal, and various other metals both hard and soft. The toothed blade is used to cut copper and brass wire, rod, tubing, aluminum, rolled steel moldings, etc. The friction disk is used to cut rolled sections such as angles, channels, etc., and also wire, rods, tubing and other steel sections.

The adjustable vise has capacity to hold tubing and other sections up to 4 in. in diameter. The spindle speeds should vary for the different wheels and materials, from 2,500 to 6,500 r.p.m. The machine can be furnished either belt or motor driven and requires either a 5 or a 7½ hp. motor depending on the operating speed.

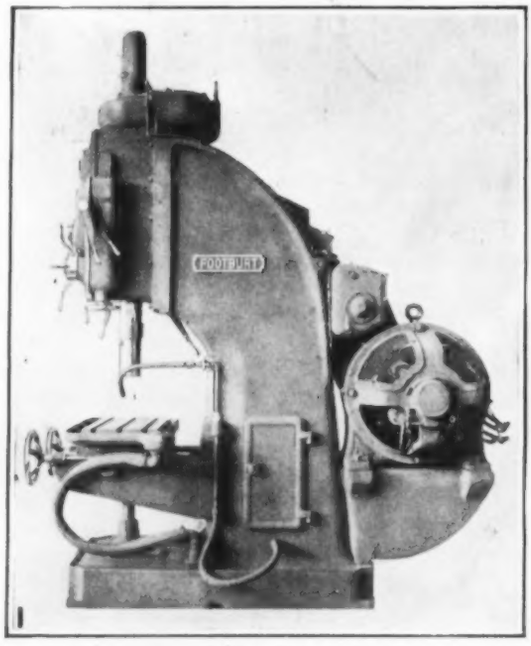


Cochrane-Bly Cutting-Off Machine

Foote-Burt No. 25½ High-Duty Drilling Machine

A drilling machine of exceptional strength and power has recently been added to the line of equipment manufactured by the Foote-Burt Co., Cleveland, Ohio. The machine has sufficient capacity to drill holes up to 5 in. in diameter in steel.

The frame of the machine is very heavy and rigid and the drilling head is bolted directly to the face of the column. On account of this construction the bolts that hold the head are all in shear and are not liable to loosen under the heavy service for which the machine is designed. The column and base are cast in one piece.



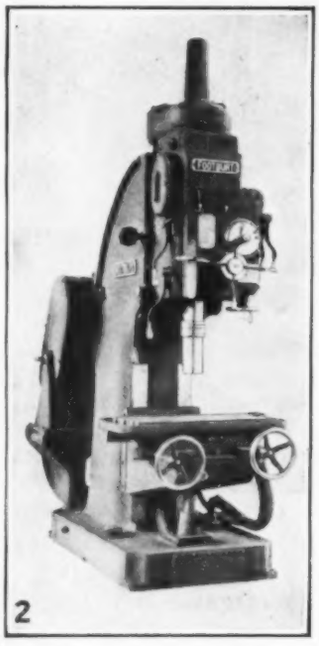


Fig. 1—Foote-Burt No. 25½ High-Duty Drilling Machine. Fig. 2—Front view of machine

All the drive and feed gearing for the spindle is enclosed in the head, so that this part of the machine can be removed without disturbing the rest of the machine. Since all the mechanism is enclosed in the head it has been possible to provide a pump lubrication system for the gearing and shafts. The machine table slides on machined guides on the front of the column and is furnished with an elevating screw that provides a vertical adjustment of 18 in. Either a plain or a compound table can be supplied, the working surface of the former being 24x24 in. and the latter having a 16½x34½-in. surface. The compound table can be moved longitudinally through a distance of 17 in. and crosswise through 12 inches.

The maximum distance from the nose of the spindle to the top of the plain table is 35 in., this distance being reduced to 30 in. when the compound table is used. The center of the spindle is spaced 18 in. from the face of the column and the total feeding length is 16 in.

Speed changes are obtained through a sliding gear arrangement similar to an automobile transmission, and nine changes of speed are available by manipulating the speed levers. By changing one set of pick-off gears a total of eighteen feeds can be obtained. Steel gears are used throughout and, with the exception of the stub-tooth sliding gears, spiral gears are used. Roller bearings are provided for all shafts and the spindle bearing is of high-grade bronze.

The machine can be furnished for either belt or motor drive, the driving motor being mounted on a bracket at the rear, as shown in the accompanying illustrations. With the driving pulley running at 500 r.p.m., the nine speeds range from 25 to 201 r.p.m., and the eighteen feeds range from 0.006 to 0.140 in. per revolution of the spindle. The net weight of the machine with the plain table is 10,000 pounds.

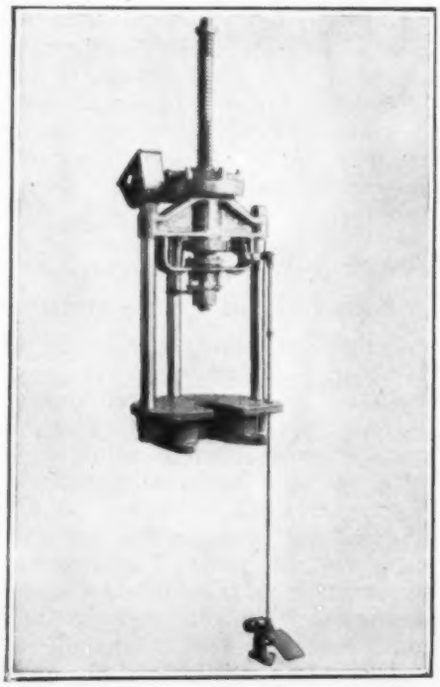
General Manufacturing Co. Flexible Power Arbor Press

A small bench model of its flexible power press is a recent addition to the line of such equipment manufactured by the General Manufacturing Co., 6442 Farnsworth Ave., Detroit, Mich. The capacity of this press is for pressures up to three tons, making it suitable for the general run of arbor press work as well as straightening, pressing in bushings and other assembly work.

The machine is entirely controlled through the treadle and the pressure of the ram can be varied from a few pounds up to the capacity of the machine. The ram is driven at constant speed through worm gearing. The ram nut carries a brake drum and revolves with the ram until pressure is applied to the treadle, this action tightening a band on the brake drum and stopping the rotation of the nut. The ram pressure is proportional to the amount that the brake band is tightened by the treadle.

The ram is returned by a coil spring and a return brake stops it at the upper end of the stroke. The table of the machine is heavily ribbed and has an opening 3 in. wide. The head is also ribbed and is tied to the table by three steel posts.

The drive pulley is mounted on the worm shaft, the steel worm driving a bronze wormwheel. The worm mechanism runs in grease and is en-



General Manufacturing Co. Flexible Power Arbor Press

closed in a case at the top of the head of the machine. The ram has a sextuple Acme thread, and the thrust of the ram nut is taken by a ball thrust bearing.

The machine will accommodate work 14 in. in diameter between the posts and has an opening of 12 in. between the table and the end of the ram. The ram has a 6-in. stroke. The net weight of the machine is 400 pounds.

D-10 "Last Word" Test Indicator

The dial indicator shown has been designed for specially accurate work and is made to order only. It has a range of 0.016 in. with a plain lever,

Lowe Dial Indicator

has an adjustable dial and magnifies 300 times, reading in ten-thousandths. It differs in this respect from the other models of indicators made by this company which have a magnifying power of 100.

The lever has a small hole near the end with a 3-deg. included-angle taper, so that contact ends of special shapes can be easily fitted when conditions require. The dial is adjustable in this model. It is made by H. A. Lowe, 1874-76 East 66th St., Cleveland, Ohio.

"Hex-Top" Grease Cup

To get away from the difficulties encountered in handling grease cups with cylindrical tops, the Link-Belt Company, 910 S. Michigan Ave., Chicago, has brought out a hexagon top for its standard grease cup. This top can be turned down by means of the ordinary wrench or by hand. It is also provided with a screwdriver slot for use when it is inaccessible to hand or wrench.

Landis Bolt Factory Threader

The Landis Machine Co., Inc., Waynesboro, Pa., has recently placed on the market a thread cutting machine which will be known as the bolt factory threader. The machine

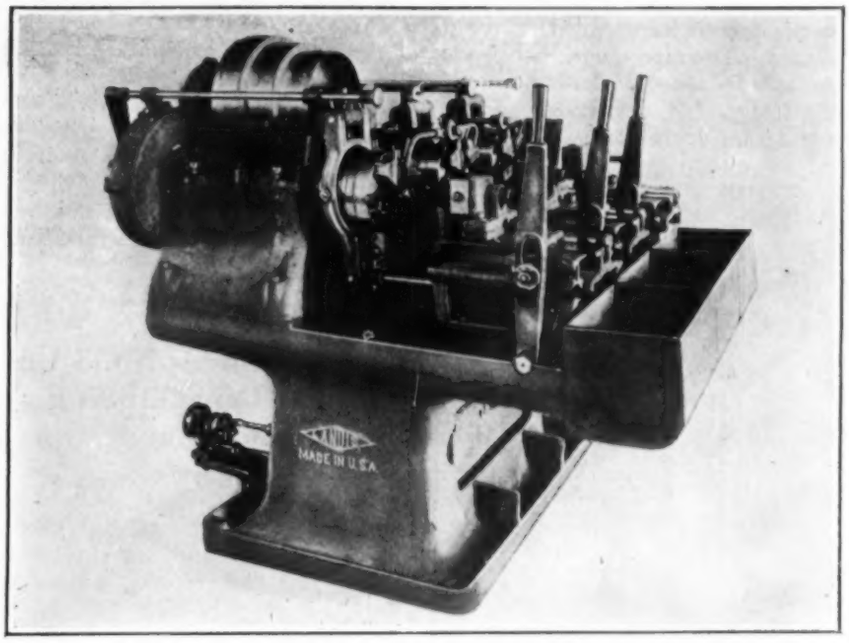


Fig. 1—Landis Bolt Factory Threader

is designed for use in bolt factories or in plants where a large production of bolts is required. In the 1- and 1¼-in. sizes it is made in the double- and triple-head types, a 2-in. size being furnished in the double-head type only.

The spindles are located sufficiently near together for one operator to handle a three-head machine without shifting his position. The spindles are independent and are controlled by clutches at the rear of the machine, as shown in Fig. 2. The clutches are operated by bars extending over the dieheads and any head may be stopped without stopping the machine.

The diehead is opened and closed automatically, the tripping rod which connects the carriage and the diehead yoke being fitted with stop collars for this purpose. These collars are easily adjusted for various lengths of thread. All spindle gears have bronze bushings.

The carriage is driven by a rack and segment gear at the center. The levers by which the carriages are operated are adjustable and may be moved to the most convenient side of the machine. The carriage can be furnished with either bolt holders or vise grips. Both have horizontal and vertical adjustment so that the work may be held in proper alignment at all times. The vise grips are operated through levers, and their jaws are hardened and can be quickly replaced without disturbing any adjustments. The carriage of the machine illustrated in Fig. 1 is equipped with bolt holders.

Boxes for holding the bolts are furnished and can be attached to

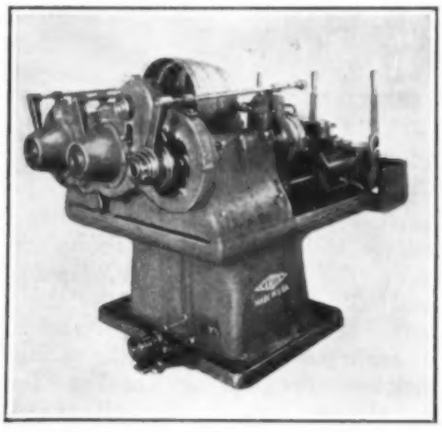


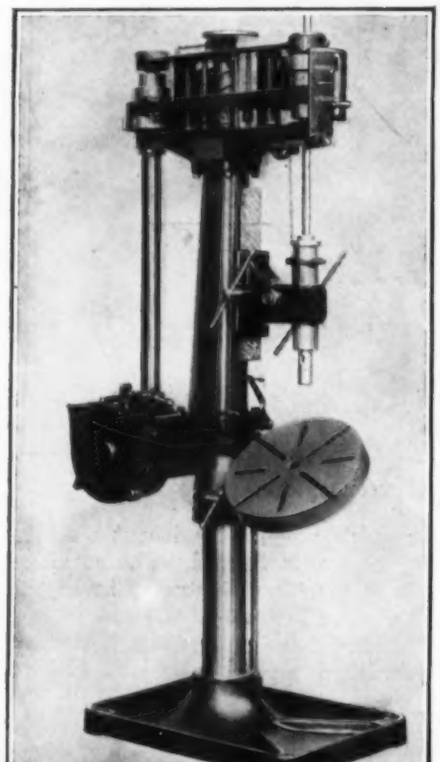
Fig. 2—Rear View of Landis Threader

the front of the machine, where they will not interfere with the operator. A geared oil pump supplies the lubricant to the diehead, and all gearing and moving parts are fully protected. The machines employ the standard type of Landis dieheads and chasers.

Fosdick High Speed Sensitive Drill

The conventional design of high speed drilling machines has been abandoned in the design illustrated, the drive being through hardened spiral gears running in oil and transmitting power to the driving cone by a vertical shaft inclosed in the tube at the back. The direct, open belt gives four spindle speeds.

Shifting of the belt is by the central cam drum controlled by the crank handle in front. The belt is shifted from one step of the cone before it is advanced in the other cone, the belt tension being automatically relieved by an idler cam. After the belt is shifted the tension is again put on the belt by the spring holding the idler. The spindle speeds are cast on the belt guard in front of cone. One turn of the crank shifts the belt one step in either direction.



Fosdick Sensitive Drill

Ball bearings are used on both cones and on the idler as well as on the drill spindle. The spindle is of alloy steel, bored for No. 2 Morse taper and accurately ground and balanced. There are 16 ball bearings in all. Spindle speeds vary from 550 to 2250. The driving cones are from 3½ to 7 in. and normally carry a 1½-in. belt. Three-step cones for 2-in. belt can be supplied if desired.

The head is dovetailed to the column, which is fitted to the base with a tongue to insure alignment. The table is 16 in. in diameter and is swiveled to tilt 90 deg. each side of center. It is graduated. It can also be revolved around the column. The head has a traverse of 10 in. and the spindle 6 in. The driving belt is 2 in. wide and the single pulley drive should run 1150 r.p.m. to give the desired spindle speeds. The machine is built by the Fosdick Machine Tool Co., Cincinnati, Ohio.

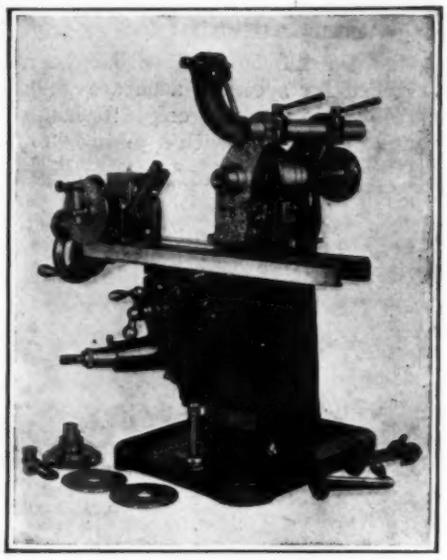
Pratt & Whitney No. 3 Universal Bench Milling Machine

The universal model of its No. 3 bench milling machine now being marketed by the Pratt & Whitney Co., Hartford, Conn., is similar to the regular plain model, previously described on page 573, Vol. 55, of the *American Machinist*. It has, however, many additions and improvements that increase the versatility of the machine. The column, spindle, three-step cone pulley, outboard support and knee are the same as on the former model, but the plain table has been replaced by one that swivels. The angular range of the swivel is 45 deg. in either direction and graduations are provided to make the setting at any position easy and accurate. A standard T-slot is provided in the table surface.

A handwheel operates the 10-pitch lead screw for traversing, and may be geared to the dividing head, if desired.

The universal dividing head is a feature of the machine and is similar to those furnished with the larger milling machines. Its spindle takes the same collets, centers, etc., as the main spindle of the machine, but it will not accommodate the chucks and faceplates on account of the small clearances. The head is mounted on trunnions and may be elevated so that the spindle is vertical, or depressed so that the spindle points 45 deg. below the center, a total range of 135 degrees. The indexing mechanism for the spindle is similar to that of the larger heads and change gears are provided for differential indexing and spiral milling.

An adjustable footstock is provided for use with the dividing head and has an adjustable center, so that the head and tail centers can be kept in line. The range of work for which the machine is adapted may be increased by the use of a vertical milling attachment bolted to the face of the machine and driven from the regular spindle. A right angle adapter can be furnished and contains gearing which allows the spindle of the vertical attachment to be swung to any angle in a plane parallel to the machine spindle.

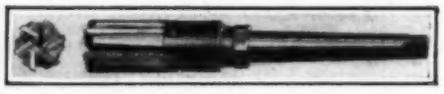


Pratt & Whitney No. 3 Universal Bench Milling Machine

The working surface of the table of the machine is 17½x2¾ in. The traverse of the table is 8¼ in. and a vertical adjustment of 6½ in. is available. The weight of the machine with the regular equipment is 185 pounds.

Ardee Expansion Reamer

An expansion reamer that resembles in appearance a solid reamer has just been brought out by the Robert R. Davis Tool Co., Wyoming and Alfred Ave., St. Louis, Mo. The irregularly spaced speed steel blades are fitted into a special collet which is controlled by a single adjusting nut. Even adjustment for the full length of the blades is claimed. The illustration shows the 1¼-in. size.

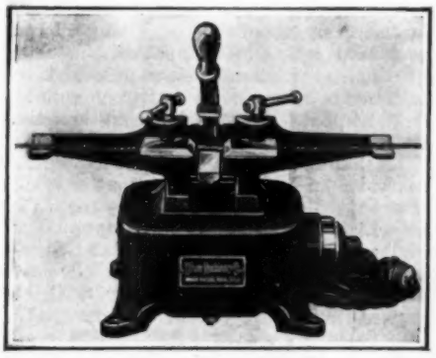


Ardee Expansion Reamer

Vulcan Band Saw Brazer

The Oliver Machinery Company, Grand Rapids, Mich., has just put on the market a new device for brazing bandsaws, the Oliver No. 462 electric bandsaw brazer. The trade name adopted for this brazer is the "Vulcan Brazer."

The heat is available by simply turning a switch and the consumption of current is insignificant. Over a hundred narrow bandsaw



Oliver Electric Bandsaw Brazer

brazes have been made with one kilowatt-hour. The operator need not be especially skilled. The brazing process can be fully observed and controlled, the heat being constantly modified by the switch.

The operation is as follows: The laps are beveled and prepared in the ordinary way. Place the ends of the saw in position in self-aligning clamps with beveled ends overlapping and under a center clamp. Place a small strip of solder between beveled surfaces and apply borax flux. Turn off the current and apply pressure with center clamp. Release the clamp and turn the switch on again just long enough to give the saw the proper temper. Test with a file and clean and polish and the operation is complete.

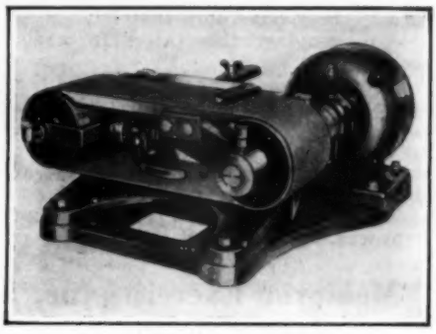
The temper is entirely within the control of the operator. If the braze is too hard, the current can be turned on slightly until the temper is drawn. Similarly if the saw is too soft any cooling down for hardening can be obtained by applying the center clamp to the heated surface after turning off the switch.

The outfit comprises a transformer, the main coil of which is connected to a power or light circuit by means of a switch and the secondary coil of which serves as a clamp for the ends of the saw which are held rigid by two screw clamps, a hand-operated hawkbill or center clamp, a switch and cord for lamp socket connection.

The machine illustrated is for bandsaws up to 1¼ in. wide. Machines for wider work are also built. They can be used on either a 110- or 220-volt circuit.

Walls Motor-Driven Abrasive Band Grinder

The Walls Sales Corp., 96 Warren St., New York, N. Y., has recently placed on the market a motor-driven model of its abrasive band grinder. This model is known as the "Simplex M" and is similar in its essential features to the belt-driven model previously described on page 269, Vol. 60, of the *American Machinist*. The



Walls Motor-Driven Abrasive Band Grinder

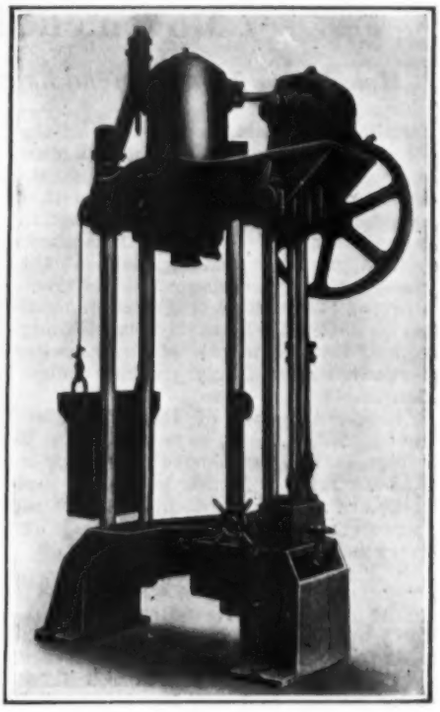
incorporation of the motor drive makes the machine portable and self-contained.

The machine is driven by a ½-hp. motor, furnished for either 110- or 220-volt alternating or direct current. The design of the mechanism of the device allows the changing of the bands without stopping the machine. The abrasive bands are 4 in. wide and the table surface is 5x10¼ in. The machine is adapted for straight-grain grinding and finishing operations on a variety of materials.

Southwark Improved Hydraulic Bushing Press

The hydraulic bushing press manufactured by the Southwark Foundry & Machine Co., Philadelphia, Pa., has been recently improved by the application of a triplex pump that speeds up the action of the press considerably. These presses are built with capacities from 30 to 200 tons, the 100-ton size being shown in the accompanying illustration.

The improved machine is entirely self-contained and requires no hydraulic connections or air piping. The rapid movement of the ram to the work is obtained through the action of the low pressure cylinder of the triplex pump, which rapidly forces a large volume of water into the ram cylinder. In addition to the low pressure cylinder, the pump also has two high-pressure cylinders. As the ram touches the work and the pressure builds up, the low pressure



Southwark Improved Hydraulic Bushing Press

cylinder is automatically cut out and thereafter discharges into the tank. The high pressure for doing the work is supplied by the two high-pressure cylinders.

At the completion of the pressing operation the ram is returned by a counterweight. A standard work table is illustrated but a variety of styles can be furnished to suit special work. An overhead crane and trolley is supplied for a chain hoist.

Belgium Buying Autos

The increased use of motor vehicles is one of the striking post-war changes in Belgium, says Consul George R. Messersmith. Prior to the war, automobiles were a luxury. In the early part of 1919 there were in Antwerp, a city of about 400,000 population, less than a dozen privately owned cars. During the following four years, however, the increase in number was phenomenal, and by the end of 1923 it was estimated that at least 50,000 passenger cars and about 22,000 trucks were in use in the country.

News of the Week

All Lines Preparing for Increased Freight Movement in the Fall

Heavier traffic may mean heavier buying of machine tools

Railroad officials, in all parts of the country, are looking for increased business as the result of the developments in the past few weeks. Reports that have been received in New York within the past ten days indicate that these railroad men are making plans at the present time to accommodate a much larger movement of traffic in September and October than the car loading figures for the month of June or the first two weeks of July give any indication of.

A recent report of the Pere Marquette, for example, says that there is a certain improvement of business in that territory. It further points out that there are assertions of confidence of an improvement of business to be heard on every hand in this territory.

Sends Out Warning

The New York, New Haven & Hartford, anticipating an increase of business for fall, has gone a step further. In a circular sent to its patrons it warns them to ship coal and any other products to be stored for winter as early as possible. The attitude of the railroads is that while there is plenty of equipment available now to handle the business, there is no telling when the amount of business thrust upon the railroads will be of such volume that it will be delayed.

Reports from the Atchison, Topeka & Santa Fe indicate that their car loadings for the first half of July were ahead of the loadings in the same period of last year. In this connection, it was pointed out, that traffic from the Southwestern district is already ahead of where it was in 1923, although no other district in the country is showing a movement of freight comparable with last year.

Grain Prices and Business

Advances in the prices of grain and grain products and of live stock have resulted in a continued movement of these commodities. The most recent report shows that the amount of grain products moved from the Western part of the United States to the East is 5 per cent over last year. Live stock shipments are also on the increase.

Several railroad executives, including representatives of the Northwestern railroads, have called attention to the fact that the traffic West is not getting under way as rapidly as possible. Preliminary reports from some of the mail order houses, however, indicate that the farmers are returning to the market. and that they will add considerably to the July purchases. This is taken as an indication that the farmers will return to the market once they have been able to get favorable prices for their crops.

Threshing machine companies and the heads of automobile companies have already taken cognizance of this fact and are making every effort to get their sales organizations in the Northwest in shape to handle an increase in business should the present signs pointing to an improvement continue.

Memorial Exercises for John Ericsson

Exercises on Thursday will mark the 121st anniversary of the birth of Captain John Ericsson, Swedish-born engineer and inventor, who built the first vessel with a screw propeller for the United States Navy and later revolutionized the navies of the world by the construction of the Monitor in Civil War times. At noon the Captain John Ericsson Memorial Society of Engineers will place a floral propeller on the inventor's statue in Battery Park. At 2 p.m. a bronze tablet will be unveiled at 95 Franklin St., the site of the house where he lived when he designed and built the Monitor. In the evening there will be a dinner at the Engineers' Club.

Bureau of Standards Tests Auto Brakes

Free tests of automobile brakes were made by the Bureau of Standards on Wednesday and Thursday, July 30 and 31. The tests were made on the grounds of the Washington Monument between 1 and 6 p.m., on the dates given.

In making the tests decelerometers were used. This instrument, invented by the Bureau of Standards, indicates the number of feet in which the brakes would stop the car from a speed of 20 miles per hour. About half a dozen of these instruments were provided for the test, so it was not necessary to keep anyone waiting.

For the past year the Bureau of Standards has been making tests on auto brakes with a view to setting safe standards for their performance. Tests of the performance of two-wheel and four-wheel brakes have been made, together with tests of the adhesion of different tire treads on the various kinds of roads encountered in driving.

The decelerometer used in the tests has a case about the size and shape of a lard pail, which is set on the floor of the car without being attached to it. Inside the case is a heavy weight held in position by springs. When the brakes are applied the weight moves against the springs and causes a pointer to move on the dial. As the force on the weight is proportional to the rate at which the car is being stopped the dial can be made to indicate the number of feet required to stop the car from twenty miles per hour without regard to the weight of the car.

Increase Expected in Steel Output

Although there has been no clear and definite increase in the demand for steel in the past week, the appearance of the market is notably improved as compared with its outlook late in June or early in July. For a couple of months it had been fairly plain that the low point in mill activity would fall about the middle of July, but while the expectations were that the rate at the low point would be 35 to 40 per cent and possibly even below 35 per cent, this month bids fair to show an average between 40 and 45 per cent, and present trends suggest that August will witness a slightly better operation. There has been no decrease in the past week or two, but rather some slight increases here and there.

No Stock on Hand

This difference between the outcome and the expectations appear to be due to stocks of steel in buyers' hands having been exhausted earlier than expected. There has been no stock of any consequence since about June 1, and while buyers may not have any confidence in the future of prices, they are forced to buy to take care of their current requirements.

This buying is rather large in point of tonnage, though it does not seem so when expressed in terms of percentage of steel-making capacity, for the capacity is very large. While many of the steel-consuming lines are somewhat depressed at the present time, they are much more active than they were in the summer of 1921. At that time, furthermore, they had large stocks of steel which they were liquidating, so that they were calling upon the mills for little steel. As a result, steel production this month will be about double that of July, 1921.

Krupp Creeps into Spain and Demands Changes in Tariff Regulations

German firm makes move to capture South American trade

Except for politics, Spain is in evolution, an industrial evolution, from Barcelona and the Province of Catalonia to Andalusia and the Basque Provinces. The hitherto rumors of Krupp interests creeping into Spain are daily taking more tangible form. Obviously it is for Spanish export trade with South America, in view of the possible commercial accords which are likely one day to intervene, as well as for the securing of the Spanish interior market for metallurgical products.

There has just been made public the constitutive elements which make up the Union Naval de Levant which groups under the Krupp banner the important Barcelona metallurgical interests known as the Nuevo Vulcano and the Maquina Terrestra y Martima, the shipbuilding yards of Tarragona and those of the Gomez company at Valencia and the navigation company of the Transmediterranea also of Valencia.

The foundation has a capital of 14 million pesetas which was largely brought to it by the Banco Transatlantica, the Bank of Catalonia, the Spanish Bank of Rio de la Plata, and the Commercial Bank of Valencia.

Agents of the Essen firm are said to be active also in the north of Spain and negotiations are being actively pushed toward acquiring the iron mines of the Asturias and various other metallurgic components and chemical works, looking forward to one day englobing also the big groupment of the Altos Hornos of Sagonto and perhaps also the iron mines of Melilla in the Spanish Moroccan zone. Krupp is thus launched in a scheme of the industrial conquest of Spain. "And accomplishing it with Spanish gold," say the critics of the peninsula. Krupp thus brings only the technical administrative competence acquiring at the same time a strategic position for German policy of the greatest value. Diplomacy enters therein in a demand by Germany that Spain abolish the coefficient which is applied on customs dues on products from low exchange countries, claiming that the new renten-mark currency of Germany now puts it on a par with America and England. The ultimatum is precise, ending with the admonition that if this is not brought about a tariff war will be started by Germany and Spanish fruits and wines will suffer in their trade with Germany. It is to be remarked that the Treaty of Versailles vaguely treated of the relations of German trade with all foreign countries up to January, 1925. Germany has thus taken time by the forelock by this movement.

The astute Essen iron masters are, as always, admirably aided by German diplomacy.

Screw Thread Report in Pamphlet Form

Many unforeseen circumstances have caused the delay in the final publication of the American Standard Screw Threads for bolts, machine screws, nuts and commercially tapped holes. Copies of this thirty-two page pamphlet may now be secured by addressing the Publication Sales Department, American Society of Mechanical Engineers, 29 West 39th St., New York.

This is the first report of the sectional committee on the Standardization and Unification of Screw Threads which was organized in the fall of 1920 under the procedure of the American Engineering Standards Committee with the Society of Automotive Engineers and the American Society of Mechanical Engineers as joint sponsors. This committee was formed for the purpose of reviewing the progress report of the National Screw Thread Commission, Miscellaneous Publication of the Bureau of Standards No. 42, to report thereon to the A. E. S. C. and to take steps, if possible, leading to international agreement.

When the standards set up by this report are generally adopted by industry the threads on this class of product will no longer be described as "U. S. S." "S. A. E." or "A. S. M. E." The terms "American Standard Coarse" and "American Standard Fine" will take their places.

This report therefore contains tables, information, etc., selected from the progress report of the National Screw Thread Commission, as applying to screw threads for bolts, machine screws, nuts, tapped holes, etc., for general use. Such changes as have been suggested have been in agreement with the National Screw Thread Commission and will be incorporated in the forthcoming revision of its report. The classes of fit have been renamed and renumbered for the sake of clearness and simplicity; the standard length of engagement has been made equal to the nominal diameter in order to deal more consistently with variations in lead; the minimum major diameter of the nut and the maximum major diameter of the screw are made basic; certain classes and sizes which may now have a limited use but which it is expected will later become obsolete have been entered in the appendix; and provision is made such that but two sets of taps and plug gages are required for a given diameter and pitch as the major and minor diameter tolerances for nuts of the free-fit class have been used for all classes.

Gages and Gaging

The section of the N. S. T. C. report dealing with screw thread gages and gaging has been given careful consideration by the sectional committee and it has decided not to specify as standard any one definite method of screw-thread gaging. A report on this subject will shortly be issued by the committee which will aim to establish, as far as possible, the fundamentals of screw-thread gaging and to point out various practices now successfully used.

Australia Buying More American Machinery

American exports of industrial machinery to Australia increased more than one and one-half millions in value in 1923 over the preceding year, according to the Industrial Machinery Division of the Bureau of Foreign and Domestic Commerce. A favorable opportunity exists for further advancement if American manufacturers will take advantage of the practical elimination of German competition from the market and a material reduction being made in the British preferential tariff.

The total of our exports in this line amounted to $5,497,986 in 1923, as against $3,687,797 for 1922. The increase was apportioned as follows: Power-generating machinery exports jumped from $260,347 to $348,732; construction and conveying machinery from $273,906 to $371,703; mining, oil-well, and pumping machinery increased from $179,391 to $467,951; metal working machinery advanced from $413,542 to $638,618; textile, sewing and shoe machinery from $578,566 to $581,531; while miscellaneous other machinery, excepting agricultural, showed progress from $1,982,045 to $3,089,451.

The latest increases of our exports indicate that the growing manufacturing industry of the commonwealth should continue to be a field of expanding opportunity for the American machinery exporter. In 1922, there were over 18,000 factories in Australia, and new enterprises are being developed each year.

Pittsburgh Plus System Ordered Abolished

The Pittsburgh plus steel case was recently decided against the United States Steel Corp. by the Federal Trade Commission, which issued an order directing that corporation and its subsidiaries to abandon the "cost plus system," which is declared to have been an unfair method of competition in violation of the Federal Trade Commission act. The commission also held that the Pittsburgh plus system involved price discrimination in violation of the Clayton act.

The decision, one of the most important ever made by the commission, is expected by members of that body to effect radical changes in the steel industry if the orders stand. It ends an investigation and hotly contested hearings in several cities.

"While the elimination of the Pittsburgh plus system will revolutionize marketing methods in the steel industry," the commission declares, "there is no reason for any fear that business conditions will be unduly disturbed thereby. No other industries employ the Pittsburgh plus system and all other industries are able to get along without it."

Many Noted Scientists Will Speak at the Franklin Institute Centenary

Elaborate program is planned for September celebration

Preparations are being made for the Centenary Celebration of the founding of the Franklin Institute, Philadelphia, which will be held Sept. 17, 18, and 19 of this year. An elaborate program has been arranged and speakers of world wide importance have been secured. On the first day addresses will be delivered by Mayor Kendrick of Philadelphia, President William C. L. Eglin of the Institute and Prof. Elihu Thomson, honorary chairman of the centenary committee. In the afternoon sectional meetings will be held.

On Thursday, sectional meetings will be continued and in the evening an open meeting will be held with the Hon. William Cameron Sproul presiding, and Sir Ernest Rutherford of Trinity College, Cambridge, the chief speaker. His subject will be "The Natural and Artificial Disintegration of Elements."

Friday will have the unveiling of the tablet at Bartol Research Foundation as the morning feature with two addresses at the Academy of Natural Sciences, one by Arthur D. Little, Cambridge, on "The Fifth Estate," and the other by Prof. D. S. Jacobus, New York City, on "Stimulation of Research and Invention." Sectional meetings will also be held during the late morning and afternoon. In the evening a banquet will be held at the Bellevue-Stratford hotel.

Famous Speakers on the Sectional Meeting Program

Among the speakers who will address the sectional meetings are the following: Prof. Joseph S. Ames, Johns Hopkins University; Prof. Wilder D. Bancroft, Cornell University; Prof. Sir Henry Bragg, Royal Institution, London; William Lawrence Bragg, Victoria University, Manchester; Prof. P. W. Bridgman, Harvard University; General John J. Carty, American Telephone & Telegraph Co., New York City; Prof. E. G. Coker, University College, London; William D. Coolidge, General Electric Co., Schenectady; Director Arthur L. Day, Geophysical Laboratory, Carnegie Institution, Washington; Prof. F. G. Donnan, University College, London; William LeRoy Emmet, General Electric Co., Schenectady; Prof. Charles Fabry, University of Paris; Prof. F. Haber, Berlin; Prof. W. J. Humphreys, Weather Bureau, Washington; George L. Kelley, Philadelphia; Prof. A. E. Kennelly, Massachusetts Institute of Technology, Cambridge; Dean Dexter S. Kimball, Cornell University; Irving Langmuir, General Electric Co., Schenectady; Prof. C. H. Mathewson, Yale University; Director C. E. K. Mees, Eastman Kodak Co., Rochester; Prof. Charles E. Mendenhall, University of Wisconsin; Prof. A. A. Michelson, University of Chicago; Prof. Dayton C. Miller, Case School of Applied Science; Prof. W. Lash Miller, University of Toronto; Ralph Modjeski, Philadelphia; Daniel E. Moran, New York City; Sir Charles Algernon Parsons, Newcastle-On-Tyne, England; Maj. Gen. Mason M. Patrick, Washington; Dean Harold Pender, University of Pennsylvania; F. W. Peek, General Electric Co., Pittsfield; Director Charles L. Reese, duPont de Nemours & Co., Wilmington; E. W. Rice, General Electric Co., Schenectady; Prof. Albert Sauveur, Harvard University; Provost Emeritus Edgar F. Smith, University of Pennsylvania; Frank J. Sprague, New York City; Maj. Gen. George Owen Squier, Washington; Prof. Julius Stieglitz, University of Chicago; Prof. Bradley Stoughton, Lehigh University; Prof. W. F. G. Swann, University of Chicago; Gen. Harry Taylor, Washington; Prof. John Sealy Edward Townsend, University of Oxford, England; Prof. Augustus Trowbridge, Princeton University; Maj. Gen. C. C. Williams, Washington; and Prof. Pieter Zeeman, University of Amsterdam, Holland.

What the Railroads Are Doing

The Great Northern Railway showed much improvement during the first six months of the year. For the period ended June 30 the net income was placed at approximately $2,600,000 which is equivalent to $1.04 a share as compared with $923,122 earned during the first six months of last year which was equivalent to 37 cents a share. The earnings were attributed to more economical operating rather than to increased business.

The Pennsylvania Railroad plans expenditures amounting to nine million dollars mostly in the Pittsburgh district. They include the rebuilding of the bridge across the Ohio River at Steubenville; the construction of a new bridge across the Beaver River from New Brighton to Beaver Falls; and some new track work on various parts of the system.

Freight Loading

Freight loading for the week ending July 12 showed a decline, the number of cars this year being 910,415 as compared with 1,019,809 during the corresponding week in 1923. However a substantial increase is shown when compared with the corresponding week in 1922.

Freight service on the Long Island Railroad has been supplemented with truck service for less than carload lots. Regular shipments are made to certain zones and centers where transfers are made to trucks for delivery to their final destination.

Locomotive exports in May numbered 21 engines valued at $278,014 as compared to 11 locomotives shipped in May 1923 valued at $151,911.

The Philadelphia and Reading has ordered forty steel passenger coaches, ten steel combination cars and ten steel baggage cars. The order was placed as follows: forty steel passenger cars to the Bethlehem Shipbuilding Corp.; ten steel combination coaches to the Standard Steel Car Co., and ten baggage cars to the American Car & Foundry Co.

The Standard Tank Car Co. has received orders for 46 tank cars from the following concerns: Carnegie Steel Co., the Bell Oil & Gas Co., the Ford Motor Co., and the National Refining Co.

Locomotive Business

The American Locomotive Co. is carrying on its books unfilled orders for $19,000,000. This compares with $17,789,000 on the books January first.

All heavy repair work on engines of the New York, New Haven & Hartford Railroad will be made at Reedville, Mass., according to a recent statement.

Excavation work has begun on the first of the six power substations on the Long Island Railway.

Class One railways during the first six months of this year installed in service 70,874 freight cars, according to a report recently filed with the American Railway Association. This was a decrease of 8,366 cars compared with the number installed in service during the corresponding period in 1923. The railroads on July 1 had on order 60,315 freight cars compared with 96,855 on July 1, 1923. During the first six months Class One railroad had installed 1,071 locomotives as compared with 1,998 during the corresponding period in 1923.

Increase in Machinery Sales to Egypt

American exports of industrial machinery to Egypt increased approximately 11 per cent in 1923 as compared with the preceding year according to *Commerce Reports* published by the Department of Foreign and Domestic Commerce. In 1922, Egypt absorbed American machinery amounting to $370,800 according to United States customs returns. In 1923, this figure increased to $412,516.

The greatest increase occurred in the construction and conveying machinery classification, exports of which amounted to $99,806 in 1922 and to $207,727 in 1923. Egypt is considering an extensive plan of public improvements and is expected soon to launch upon a definite program of public works. There should be an increased demand for construction and contracting machinery of all kinds, where original cost and operating expenses do not prove out of line with the cost of cheap local labor which is very plentiful in all parts of Egypt.

A favorable increase was made in the classification covering power generating machinery except electric. In 1922, American exports of this type of machinery to Egypt amounted to only $5,571. In 1923, this figure rose to $10,852. The largest items in this classification comprise the steam engine and boiler accessory groups.

Notes of Washington Activities

By Paul Wooton

The difficulty of explaining a policy on a controverted question may preclude the Department of Justice from making any announcement before the election on trade association statistics. Any pronouncement which might be made at this time on that subject, in the opinion of politicians, would be capitalized by the opposition during the campaign. Regardless of the attitude the department might assume, it would be difficult for it to justify its position in the short time intervening before the elections, the politicians think. While no comment on the matter is forthcoming at the department, it is the opinion in other well-advised quarters that nothing will be done until after the election.

There is reason to believe that the new Attorney General is in thorough sympathy with removing any uncertainty that may surround trade association activities. He is thought to realize, however, that it is difficult to know just how a line can be drawn which would clarify the matter. It is certain that there is no disposition to allow the study now being made of the general subject to interfere in any way with the prosecution of those who are using the trade association as a cloak to defeat the purpose of the anti-trust statutes. On the other hand, there is reason to believe that trade associations who are engaged in those activities which are generally recognized as being legitimate, are in no danger of prosecution.

New Ruling

The Treasury Department has ruled that aluminum waste, or dross, is entitled to enter the United States free of duty under paragraph 1562 of the tariff act as a crude mineral substance.

The ruling arose through a variance in practice between customs officials at Buffalo and at New York. The appraiser at Buffalo held aluminum waste entitled to entry free of duty. The appraiser at New York, on the other hand, made an advisory return on an importation as dutiable at 10 per cent ad valorem under paragraph 1457 of the tariff act covering waste not specially provided for.

Analysis of a sample of the aluminum waste scrap made for the Treasury Department showed it contained 66 per cent of aluminum and the Department ruled that it was entitled to entry free of duty.

Coal Mining Machinery

Illinois' loader scale came as an unexpected, but highly gratifying surprise to official Washington. It is regarded as a progressive step of outstanding importance. Opposition to the employment of machinery in coal mines long has been regarded as one of the sinister things which could be laid at the door of the union. The Illinois membership of the United Mine Workers has been regarded as the most reactionary element in that organization. That it should be willing to take this progressive step is regarded as making certain the universal application of this policy.

On the assumption that this agreement soon will apply to the entire Illinois field, it is predicted that there will be an appreciable lengthening of the radius which marks the limit of the territory in which Illinois coals can compete. This step toward lowering production costs in Illinois did not come too soon as the mines in that state have been operating at 25 per cent of capacity for four months.

It is recognized that this action in Illinois, combined with the acceptance of a reduction in their wage scale by the miners in southern Ohio, and with the informal understandings at individual mines, will have far-reaching effects on the market situation. The fact that the union fields suddenly find themselves in a position to reduce production costs just at the time when everybody believes the market is turning definitely upward, means that the union fields are going to supply more of the country's requirements for the coming winter than anyone had anticipated.

News of the Automobile Industry

Charles M. Schwab, chairman of the board of directors of the Bethlehem Steel Corp., announced he had accepted the chairmanship of the Six Wheel Co., of Philadelphia, which will manufacture a new type of six-wheel motor bus and truck.

The six-wheel idea has been applied before to trucks designed to carry exceptionally heavy loads. Heretofore, such trucks usually have been used with a two-wheeled trailer, the front end of which rested on the truck's rear. In the new truck the rear four wheels will be assembled in one unit, and power and brakes will be applied to all four wheels.

The Brooklyn-Manhattan Transit Co., New York, announced that it has bought ten double-deck buses and would experiment with this form of transportation.

The new B.-M. T. buses have a seating capacity of sixty-seven. Each bus will have a uniformed conductor and driver. The buses operated in Fifth Ave. seat from fifty-one to sixty-four passengers.

Reports from Newark, N. J., indicated that bus operation there was becoming increasingly profitable. During the first six months of 1924, 47,567,053 passengers were carried, an increase of 2,272,636 over the period in 1923. The total revenue was $2,684,369.47—$245,727 higher than for the period last year.

Major Gen. Mason M. Patrick, Chief of the Army Air Service, announced that a contract had been placed with the Loening Aeronautical Engineering Corp., of New York for the construction of a group of ten Loening amphibian planes. The development and flight conducted in secret during the past few weeks.

The Toledo assembly plant of the Chevrolet Motors Co. has opened up with 450 men. The Mather Spring Co. also has resumed operations, both having been closed since April.

The industrial outlook is brighter, according to D. O. Skillen, general manager of the Muncie Products Co., Muncie., Ind., a branch of General Motors, in confirming a report that many men were to be added to the working force immediately. While Mr. Skillen said he could not give the exact number to be added to the payroll, it is understood more than 200 men will be put to work in addition to the force with which the plant has been operated for the last few weeks.

Wills-Sainte Claire, Inc., are not contemplating the introduction of a "Straight Eight," according to a statement made by C. Harold Wills, president of the company and designer of the Wills-Sainte Claire. "In view of the persistent rumor that has been abroad for some time, that we are going to come out with a Straight Eight," said Mr. Wills, "we feel that either a denial or an admission is in order. We are not even contemplating a Straight Eight, for the simple reason that there is neither a sales nor an engineering reason for us to depart from our present type."

Net earnings of the Maxwell Motor Corp. before taxes for first six months of 1924 are estimated at $475,000, after absorbing expenses during the first three months of putting the Chrysler models into large production. They represent less than two months' earnings at current rate. Both Maxwell and Chrysler divisions are making money.

For the first six months of 1923 net after taxes and all charges was $3,072,532.

Orders on July 15, 1924, were exactly three times those on hand a month previous. Sales in June were 3,200 Maxwells and 3,000 Chryslers. Chrysler output is being increased to 165 a day at the present time.

The General Motors Corp. earned in neighborhood of $1.15 a share on common after prior dividends and charges on common during first six months of 1924. This is nearly equal to entire 1923 dividends on common stock. The corporation's business has shown a pronounced increase since July 1 and officials are estimating the year's earnings at from $1.90 to $2.00 a share.

Alfred P. Sloan, Jr., president of the General Motors Corp. denies that there has been any change in the relationship between General Motors and the AC Spark Plug Co. It had been rumored that Albert Champion, president of the spark plug company, had sold his interest to General Motors but this is not the case.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance*, New York

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IS IT inflation or the result of an improved demand for the smaller supplies in prospect?

This is the question that all thoughtful business men are asking as first one and then another staple commodity joins in the movement toward higher prices. Week before last this movement included grain, hog products, cotton, wool, rubber and coffee. Last week grain and cotton had another sensational advance and copper, zinc, lead and lumber were added to the list of things that have risen in value, while demand for steel improved considerably, though it is not yet reflected in price advances. Copper in particular seems to have drifted into a very strong position as the relatively large offtake has so reduced supplies that consumers are becoming a little uneasy.

The rise in grain is due to the reiterated reports of a crop failure in the United States as well as in Canada and cotton is up on a Government report which has revived the fear of another famine crop, although its accuracy is seriously questioned by many experienced observers. If it should prove to be correct and the crop continues to deteriorate the world's textile industry will indeed face a serious situation unless the cheaper linen or synthetic cotton of which there is so much talk shall be made available in quantity.

The market for stocks and bonds has shared in the general buoyancy. The rails, the public utility shares and the copper stocks have led in the order named. Many new railroad consolidations have been effected by the imaginative and while none of them has as yet been consummated they have at least served to advance prices. Some are interesting and ingenious, but they are not described in detail here lest they might prove misleading.

Money continues easy. Call loans outside the Stock Exchange have been made at 1½ per cent and it is reported that "sixty day money" has been obtainable at 2¼ per cent. The banks are reducing the interest allowed on credit balances and some are predicting that the Federal Reserve Bank of New York will shortly cut its rediscount rate to 3 per cent.

These predictions seem to be unwarranted and it is advised that they should be received with reserve. But if by any chance they should prove to be correct the effect will be to further inflame a speculative situation that is already highly inflamed and should now be regarded with caution. Prices that are sufficiently high to be remunerative to the producer are always desirable and healthfully stimulating, but if the present upward movement is the first phase of the American gold inflation that so many economists have prophesied then the problem of charting a safe course for business becomes a very difficult one.

The indicators that will be the safest guides are the Federal Reserve ratio and the quotations for foreign exchange. When the first commences to fall and the latter rise to anywhere near parity a cessation of the golden flood by which we have been inundated will be foreshadowed and contraction will impend.

Thus far there is no suggestion that either contingency is imminent but the rise in the London money market and a sharp and inexplicable advance in sterling exchange last week are hints that should increase the vigilance of those whose duty it is to be on the lookout.

But these long distance views of a highly complex future need not disturb confidence in American business during the next few months. Distributive trade is good and promises to be better for it takes time to diffuse the optimism which now pervades the speculative markets. It is, moreover, true that the farmers must harvest and sell at least a portion of their production before they can spend the profits which the recent advance in prices has brought them. Merchants and manufacturers are, however, getting ready to supply the demand and the automobile industry, always alive to its opportunities, is again increasing production.

In so far as the domestic outlook is concerned the only dark spots that remain are the cotton manufacturing industry and the shoe and leather business. The depression in these two lines is due to causes that are almost fundamental. There is a shortage of cotton, and silk, especially artificial silk, is gradually taking its place for women's clothing. Some very far reaching changes appear to be inevitable. They need not affect the whole business structure, but they will bear heavily upon parts of it.

In so far as the shoe industry is concerned it appears to be a case of diminished consumption due to the fact that shoes last longer because every one rides in motor cars. In time the demand will grow up to the production if no new factories are built. The shoe manufacturers of New England are meantime trying to reduce wages, but it seems doubtful whether the operatives will assent to the cut proposed.

The zealously cultivated fear that LaFollette's candidacy will throw the election of a President into the House of Representatives should perhaps be added to the list of repressive influences, but it need not be taken seriously as yet. The election is only three and a half months off, but the political kaleidoscope changes daily and Mr. LaFollette's prospects may also change.

What's Doing in Industry

Japanese buying and an increased number of inquiries were the features of this week's markets in machinery and machine tools. A better tone is felt in all centers and improved business is anticipated with railroads, automobile builders and general industries all expected as purchasers. Indirectly the machine tool builders will benefit by the prosperity of the wheat, corn and cotton farmers and the hog raisers. Agricultural implements must be bought and automobiles will also be purchased with the sudden inflow of money to the Midwestern and Southern districts.

Bus and truck builders are busy and reports from the big companies show exceptional business during the first six months of the year with prospects good for the remaining half.

Electrical goods are still selling well and the volume of sales, although behind last year's remarkable record, shows signs of improvement.

Industrial building during the past week took a phenomenal rise with totals amounting to $4,749,000, according to *Engineering News-Record*, whereas during the corresponding week in 1923 the totals were only $1,500,000. However, for the first half of the year there was a decrease as compared with the same period last year.

The stock market was very active during the past week with rails leading, many again going to new highs. Oils also showed some activity and steel, despite the adverse reports of the Bethlehem company and the Pittsburgh Plus ruling, were steady. Other stocks were steady or increasing except in a very few instances.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Indianapolis

While the volume of business only shows a slight increase during the last two weeks, the general outlook for machine tools and metal working machinery is much brighter than it has been at any time during the present year. Several lines of industry are making inquiries concerning both machinery and tools and it would appear that this unusual volume of inquiry should lead to business. At least that is how the local trade believes. Officials of E. C. Atkins & Co. report a better condition on the West coast and in the Southern field. They attribute this to the fact that construction is picking up and the demand for lumber is increasing. Back of the whole thing, they say, is the recent increase in grain prices, which if continued, will bring the farmer back as a buying power.

Demand for special machinery and tools is increasing from the farm implement factories in various parts of the state. These factories have been out of the market for some time. The demand from automobile sources, however, is not normal and continues as lifeless as during the last three months. Some inquiries are being received from this source, however, and early fall is expected to see an increase in this business. It is known the manufacturers are optimistic and believe demand for closed models will pick up materially within the next month. There has been no increase in production schedule, however.

Detroit

While motor executives agree that the outlook for fall is much better than the experiences of the past two or three months, there is a decided tendency in the automotive field to go slow on predictions as to when the market for machines will regain its strength.

This tendency is having its effect upon the machinery and machine tool industries, but leaders in the local field believe that the worst of the period of depression is over. They point to the fact that during the past week or ten days orders have been received as a result of inquiries directed months ago, in some instances as early as March and April of this year.

New equipment is being ordered in normal quantities by the automobile and accessory plants, but there is no outstanding job just at present, unless the Ford company's building program at the River Rouge plant may be so considered.

The Oakland company has just placed a large order for machine tools.

One of the most important statements reflecting the view held by motor car leaders is that issued by Ross W. Judson, president of the Continental Motors Corp., in reviewing the third quarter of the present fiscal year. Mr. Judson says that the outlook in the automotive field has recently changed considerably, and that indications point to a splendid business this fall.

"May and June shipments from both our Detroit and Muskegon plants were better than our expectation," said Mr. Judson, "and our July schedules for Detroit show an increase of from 10 to 15 per cent over June. Our Muskegon plant is very busy on increased motor truck schedules and the orders we have received for our new bus motor greatly exceeds our capacity to deliver them. We anticipate considerable activity this fall on the part of the bus manufacturers."

Southern District

Slow but gradual improvement has been noted in machine tool sales in the Southeast the past two weeks, with most dealers expressing themselves as well satisfied with the outlook for the next few weeks, and anticipating a decided betterment in the volume of business during the late summer and fall months. Especially is the outlook for fall business good, due to the excellent agricultural prosperity of the district which is having a favorable affect on all lines of business. Cotton prices have advanced the past two weeks on an average of $5 per bale, and with an 11,500,000 bale crop in prospect selling at about 30 cents per pound, the situation is certain to favorably affect machinery and tool sales in all parts of the South. Financially, it will prove one of the best years in the history of the cotton industry.

Among the principal buyers of equipment at present are the road builders and building contractors, railroads, the automotive repair industry and smaller machine shops, while some betterment also is noted in sales to the textile industry, though not much. Railroads still are inquiring on a fair basis for heavier equipment, and dealers handling this trade are reporting good sales of shop machinery to the principal Southern lines. Much of the buying by Automotive service stations is of used machinery and tools, but a fairly good amount of it is being reported. There is promise of further improvement in the textile field within the next month, following the long period of depression this industry has felt in the South. Building contractors and road builders also are expected to continue buying on about the same basis during the next month or six weeks, with most dealers reporting this field buying about 12 to 15 per cent better than last season.

Gross equipment sales the last two weeks of July were better than the first part of the month, and with most of the larger dealers also showed a good improvement over the corresponding period in 1923.

The opinion of the Atlanta dealers is that business during the last six months of this year will be about 10 to 12 per cent better than the last six months of 1923, which will serve to make 1924 about 9 to 10 per cent better than last year.

Canada

While other lines are suffering the consequences of midsummer dullness, the machine tool industry in Canada is keeping up well, due partly to fairly large orders from the railroads. Relatively little activity exists in the steel and iron industries. Sales of pig iron are largely confined to small lots for immediate use. The same is true of steel bars and sheets. The demand for machinery cast scrap has slightly improved. Stove plate is moving in a better manner, and small sales of car wheels have been reported. June production of steel ingots and castings was 68,914 tons, or 37 per cent less than the May output of 108,433 tons. Resumption of special rates on iron and steel goods shipped West, in the Crow's Nest Pass agreement, is expected to bring more business to the metal working industry of the East.

The Canadian Car & Foundry Co. shipped 150 fifty-ton composite Hart-Otis ballast cars and ten all-steel second class coaches for the Canadian National Railways. A number of substantial orders are being received by construction and engineering works, although they are operating at reduced rates.

As a result of foreclosure proceedings taken in Toronto against the British-American Nickel Corp. that concern has been forced to close down on all operations, including the big refining plants near Ottawa and the extensive mining interests at Sudbury. The National Trust Co. has requested the sale of all assets to satisfy a mortgage which is security for $6,000,000 bond issue.

An indication of the prospects that are being provided for by the paper industry of the Dominion is the number of paper-making machines for which definite orders have been placed. One large company has orders for two 234-in. newsprint machines, one 156-in. machine for Newfoundland, five wide

newsprint machines and one small wrapping paper machine.

Eastern Canada is now measuring its autumn business prospects by the varying condition of grain in the Western provinces. There seems fair assurance that an attractive price will be realized, regardless of the size of the Canadian yield.

New York

Another list of machinery and machine tool requirements has been sent forth by the Japanese, much to the satisfaction of the machine tool builders and large dealers in the East. Most dealers in the New York district state that it is evident that the Japanese orders are to be given in a series of comparatively small lists rather than in one large list covering everything. While the wisdom of this is doubted by some it is pointed out that it will help distribute the business over a longer period and over normally dull months.

Inquiries from railroads, general industries and big electric companies improved substantially this week in the New York market and there were also some requirements asked for by automobile accessory makers in the district. Sales, too, improved during the week and altogether both the present and the future are brighter than they have been for a long time.

The farmer's prosperity in the wheat belt means more agricultural machinery and more automobiles, which in turn means more machine tools with which to build these products.

Milwaukee

The situation in the metalworking machinery market at the close of July presents a far more interesting as well as encouraging picture than one month and two months ago. The betterment in business is only relative, however, for the operation of plants manufacturing metal working equipment still is below a normal level, owing to the light volume of business passing. It is among the local dealers that the most impressive proof of a quickening of business is found.

Automobile factories again are furnishing the bulk of the business, although their purchases are scattering and demands are not by any means as heavy as a year ago. The principal buying seems to be for the purpose of piecing out equipment, replacing obsolete or wornout tools, or effecting slight advancement in output. During May and June the main call was for toolroom equipment, as might be expected at a time when these shops are tooling for the regular, quantity production of new models.

Local dealers have been getting very little railroad business from shops in this locality, but there is some in sight. Railroad construction and repair shops are again operating at a more nearly normal level after laying off the bulk of their men during the first two weeks in July.

Manufacturers of contractors' equipment in this locality report steady orders and are shipping more machinery this summer than last. These shops have been good buyers of tools. The agricultural implement industry is coming along a little better than last year and manufacturers have reason to believe that fall and winter business will be the best in at least four years. This industry has done very little in the way of retooling during that time, and the feeling in the machine tool industry is that implement builders will be among the best customers of the coming year because the average piece of shop equipment is more or less obsolete and the effort is to effect every possible economy from a production standpoint, so that more modern tools, such as have been designed and developed in four years will be desirable.

Railroads Urge Early Coal Shipments

Preparations for a large movement of freight during the late summer and early fall have been started by the Interstate Commerce Commission, the American Railway Association, the Eastern Presidents' Conference and a number of the individual railroads. Indications of a pick-up in industry generally, an exceptionally heavy movement of coal, a heavy fruit crop and a large movement of grain within the next few months are indicated by each of these organizations.

Coal has been singled out because of the depressed condition of the market and the comparatively small amount that has been moving. An appeal for the shippers of coal to get their supplies moving as early as possible has been sent out by the Interstate Commerce Commission.

Reports of the American Railway Association indicate that there are more than 7,000 surplus locomotives and approximately 360,000 surplus freight cars in good repair and awaiting service. At the same time some of the railroads have sent out circulars advising their customers to ship early. Among such notices sent out was one by the New York, New Haven & Hartford recently.

Obituaries

ARTHUR W. HOOPER, for 40 years a member of the directorate of the Winchester Arms Co., died recently in Boston, aged 78 years. Mr. Hooper joined the Winchester organization as manager of the New York office July 1, 1878, and in 1880 transferred to the New Haven office, where he became secretary and later treasurer. In 1890 he was elected vice-president, serving until 1900. His election to the directorate took place in 1881 and he retired in 1921.

ISAAC H. DENTON, aged 49 years, died recently in Cleveland. He was the president of the Denton & Anderson Co. and was formerly secretary of the Cleveland Tool & Supply Co.

ROBERT H. CARLISLE, vice-president of the Strong, Carlisle & Hammond Co., Cleveland, died recently in Cleveland.

ERNEST KUNERT, founder of the Kunert Manufacturing Co., Watertown, Wis., one of the earliest machine shops in the Northwest, died July 20 at the age of 77 years. He retired twelve years ago when failing sight made it impossible for him to continue active work. Blindness overtook him eight years ago. The Kunert company later became the Dornfeld-Kunert Co., and the plant is now occupied by Monarch Tractors, Inc., the outgrowth of the machine shop, foundry and boiler works.

HAROLD COLBERT JONES, president of the Midwest Forging Co. and formerly vice-president of the Inland Steel Co., died recently in Chicago.

Business Items

The W. C. Fletcher Co., 1016 Fletcher Building, Indianapolis, Ind., has been appointed the agent for the Triumph Electric Co., Cincinnati, for the southern part of Indiana.

The Paulson Tools, Inc., is a new industry organized by Charles H. Loucks, A. R. Paulson and others of Wallingford, Conn., and will engage in the manufacture of tools for use in railroad construction.

The Great Western Motor Co. has taken over the plant of the National Axle Corp. on the Oakland highway, near San Jose, Calif. The plant was erected about four years ago at a cost of $160,000. Tractors were the chief output of the concern and these will be continued.

The Fox Machine Co., Jackson, Mich., has received several orders for multiple spindle drilling machines from Japan.

The Ruggles Motor Truck Co. of London, Ontario, which closed its doors some months ago, and was recently purchased by a Toronto broker, has passed into control of the parent Ruggles Co., Saginaw, Mich. The Canadian staff is now being organized and John Bridge has been appointed general manager.

The Metal Crafts Corp. of New Haven, Conn., filed a certificate of incorporation at the office of the Connecticut state secretary during the week. The authorized capital is $150,000 with $75,000 paid in. The incorporators named are Gardner E. Wheeler, 64 Marvel Road, New Haven; M. C. Curran, New Haven; Arthur J. La Montague, 46 Cherry St. Milford. The company will engage in the manufacture of mechanical appliances, tools and fixtures.

The Seymour Products Co., was recently incorporated at Seymour, Conn., to engage in the manufacture of all kinds of tools, etc. The new firm has a capitalization of $100,000 and the incorporators are: Clayton S. Booies, Seymour; C. L. Hopkins, Woodbridge; Franklin S. Jerome, Orange; Bernard H. Mattheis, Seymour, and Henry R. Naylor.

Davis & Hemphill, Elkridge, Md., are building an extension to their factory that will increase their floor space about one-third.

The building and contents occupied by the Conboy Carriage Co., in Toronto were destroyed by fire, the damage to the machinery and equipment amounting to $250,000.

It has been announced at the Worcester offices of the Wickwire-Spencer Corp. that the Blue Island, Ill., Mount Wolf, Pa., Clinton, Mass., and Worcester plants will resume operations at once on an increased production schedule.

The Anchor Brass Works has been established at 145 Stewart St., San Francisco, Calif. George W. Mitchell and A. J. Lindersmith formerly with W. T. Barratt & Co. are connected with the Works.

The Kingston Shipbuilding Co. Ltd., has been incorporated in Canada with a capital of $1,300,000 to carry on construction work including ships, dredges, railway terminals, power houses, etc. Headquarters will be in Kingston, Ont.

The Cleveland Duplex Machinery Co., Cleveland, has been appointed exclusive representative of the J. P. Buhr Machine Tool Co., Detroit, for the sale of Buhr multiple-spindle drill heads and drilling machines. This arrangement covers that section of Ohio which is known as the Cleveland territory.

The Norma Co. of America, Long Island City, N. Y., has changed its corporate name to the Norma-Hoffmann Bearings Corp. There has been no change in the personnel of the company.

The Motor Wheel Corp., Lansing, Mich., has resumed operations after a two weeks' shutdown. In the future seventeen hundred people will work five days a week.

Personals

W. P. LOTZ has succeeded B. W. STONE as manager of the New York branch office of the Kearney & Trecker Corp., Milwaukee.

J. K. WOOD is opening an office at 46 W. 40th St., New York City, where he will engage in consulting mechanical engineering. He will specialize in spring design and materials.

F. F. ELLIOTT has been made works manager of the Cleveland foundry of the Westinghouse Electric & Manufacturing Co., succeeding the late CHARLES F. KNOWLTON.

D. H. BOOTHBY has been appointed New York City representative of the Leland-Gifford Co., Worcester, Mass. His headquarters will be at 149 Broadway.

WALTER L. LOEGLER has been appointed Philadelphia representative of the Warner & Swasey Co., Cleveland, Ohio. He was formerly with the sales department in Cleveland..

C. E. COATS sailed July 26 on the S.S. "Albert Ballin" and will spend six weeks in England, France and Germany.

DOUGALD CAMERON has been appointed manager of the machine shop and foundry department of John T. Hepburn, Ltd., Toronto.

HAL L. PURDY, who has just been appointed vice-president and assistant general manager of the Nordyke & Marmon Co. of Indianapolis, has been an official of the company since 1915. Mr. Purdy became an officer of the company June 1, 1915, when he was appointed assistant purchasing agent. He came to Indianapolis from Detroit where for three years from 1911 to 1914, he was production supervisor of the Packard Motor Car Co. From 1914 until 1915, when he resigned to assume his connections with the Nordyke & Marmon Co., he was general manager of the Detroit Steel Cooperage Co.

LEROY J. SCOTT has been made sales manager of the Michigan plant of the Steel Products Co. Scott's appointment became effective July 1 and enables him to assume full responsibility for the work he has been handling unofficially for the last six months.

FREDERICK H. LOVEJOY has been elected vice-president of Wheelock, Lovejoy & Co., Cambridge, Mass.

J. L. WILLIAMSON, who for the past eight years has been in charge of gear design and research work in the railway motor department of the General Electric Co., Schenectady, has severed his connection with that company and has taken a position with the Fellows Gear Shaper Co., Springfield, Vt., as research engineer.

MORTIMER J. P. MOORE has left Day & Zimmermann in Philadelphia to accept a position in the stoker department of the Westinghouse Electric & Manufacturing Co. at Lester, Pa.

PAUL WILKINS has left the H. H. Franklin Co. to become connected with the Skinner Automotive Device Co. in Detroit.

A. ORAM FULTON formerly vice-president of Wheelock, Lovejoy & Co., Cambridge, Mass., has been elected president and general manager, succeeding HARRY F. STIMPSON, resigned.

S. L. BENKE has been appointed manager of the structural steel department of John T. Hepburn, Ltd., Toronto.

RALPH MORLEY has been appointed distributor for the New York district by the Ward Leonard Electric Co. His headquarters will be at 5 Great Jones St., New York City.

B. L. WORDEN has been elected president of the Cutler-Hammer Manufacturing Co. He succeeds F. R. BACON who has been made chairman of the board of directors, a new office for this company.

HARRY F. STIMPSON has withdrawn from active participation in the firm of Wheelock, Lovejoy & Co., Cambridge, Mass., to devote more of his time to industrial real estate.

Merger of Canadian Power Companies

Through the incorporation of the Duke-Price Power Co., Ltd., with a capital of $1,500,000, definite form was given recently in Quebec to the joining of the J. B. Duke interests of New York and the Price interests in Canada, which have been working together in the Chicoutimi and Lake St. John districts. The purpose of the incorporation is to develop and dispose of electric current within that part of the Province of Quebec.

It is understood that the principal source of the power will be at the $25,000,000 development in progress at the Grande de Charge, where the work is being conducted through the Quebec Development Co.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by reefrring to the number following each item.

Motor Accessories. Johannesburg, South Africa. Agency. Reference No. 10,920.

Industrial machinery. Bahia, Brazil. Agency. Reference No. 10,921.

Machinery. Rangoon, India. Agency. Reference No. 11,009.

Machinery. Bahia, Brazil. Agency. Reference No. 11,012.

Industrial machinery, gas and water meters, and pumps. Santiago, Chile. Exclusive agency. Reference No. 11,040.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers Fourth annual machine tool exhibit, Sept. 15-18. Mason Laboratory, New Haven, Conn. H. R. Westcott, chairman.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Motor and Accessory Manufacturers' Association. Annual meeting, Cleveland, Ohio, Week of Oct. 6.

American Foundrymen's Association. Twenty-eighth annual convention. Milwaukee, Wis. Week of Oct. 13, 1924.

National Industrial Advertisers Association. Annual meeting, Edgewater Beach Hotel, Chicago, beginning Oct. 13, 1924.

Management Week. Under the auspices of the American Society of Mechanical Engineers. Week of Oct. 20, 1924. New York City.

American Gear Manufacturers Association. Semi-annual fall meeting. Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 16, 17 and 18. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Forty-fifth annual meeting. New York City. Dec. 1 to 4. Calvin Rice, secretary, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Grand Central Palace, New York City, Dec. 1 to 4. Charles F. Roth, 1102 Grand Central Palace Building, New York City.

Exposition of Invention. Engineering Societies Building, 29 West 39th St., New York City. Dec. 8 to 13 inc., General offices, 47 West 34th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig-iron buying is slow. Price of No. 2 f'dry iron remained unchanged during the week at $18.00@$18.50 per ton at Birmingham. Weakness is still apparent in prices of steel products. Bars are firm at $2.15 per 100 lb., while shapes and plates are quoted at $2.00 per 100 lb. Pittsburgh.

Non-Ferrous Metals—There is an improved sentiment in the non-ferrous metal market. The firmness of the market is denoted by the following price changes since July 18: the minimum for copper is ¼c. per lb. higher, tin advanced 2¼c., lead ½c. and zinc ¼c. per lb., New York market.

(All prices as of July 25)

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	18.00@18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	$2.70@2.80	3.89	3.55	3.80
No. 12	2.85@2.90	3.94	3.60	3.95
No. 14	2.95@3.00	3.99	3.65	4.00
No. 16	3.15@3.20	4.09	3.75	4.10
Black				
Nos. 17 and 21	3.50	4.40	4.25	4.55
Nos. 22 and 24	3.55	4.45	4.30	4.55
Nos. 25 and 26	3.60	4.50	4.35	4.60
No. 28	3.50@3.65	4.60	4.45	4.50
Galvanized				
Nos. 10 and 11	3.60@3.80	4.65	....	4.60
Nos. 12 and 14	3.70@4.90	4.75	....	4.70
Nos. 17 and 21	4.00@4.20	5.05	....	5.00
Nos. 22 and 24	4.15@4.35	5.20	5.00	5.15
No. 26	4.30@4.50	5.30	5.25	5.30
No. 28	4.60@4.80	5.60	5.55	5.50

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.85	8.00	6.55
Hoop steel	4.49	3.96@4.36	4.15
Cold rolled strip steel	7.00	8.25	7.15
Floor plates	5.55	4.60	5.50
Cold drawn shafting or screw	4.15	4.00	3.80
Cold drawn flats, squares	4.65	4.50	4.30
Structural shapes (base)	3.34	3.21	3.10
Soft steel bars (base)	3.24	3.11	3.00
Soft steel bar shapes (base)	3.24	3.21	3.00
Soft steel bands (base)	3.99	3.61	3.65
Tank plates (base)	3.34	3.43½	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Tool steel	11.00	....	....
Drill rod (from list)	60%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.25
Tin, 5-ton lots, New York			49.50
Lead (up to carlots), St. Louis	6.95	New York	7.75
Zinc (up to carlots), St. Louis	6.05	New York	6.87½@7.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	27.20	28.00	28.50
Antimony (Chinese), ton spot	9.25@9.50	10.50	10.00
Copper sheets, base	19.50	19.75	22.50
Copper wire, base	15.00	17.50	21.25
Copper bars, base	18.75	20.75	22.00
Copper tubing, base	21.75	25.75	24.75
Brass sheets, base	16.25	20.50	19.25
Brass tubing, base	20.50	25.50	27.25
Brass rods, base	14.00	16.50	17.00
Brass wire, base	16.75	20.50	19.75
Zinc sheets (casks)	10.25	10.75	....
Solder (½ and ¼), (case lots)	33.75	32.00	30.00
Babbitt metal (83% tin)	60.00	58.50	48@52
Babbitt metal (35% tin)	28.00	17.50	23@26
Nickel (ingot and shot) f.o.b. refinery	27.00	....	....
Nickel (electrolytic) f.o.b. refinery	30.00	....	35.00
Nickel (F shot) f.o.b. refinery	30.00	....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Shop Materials and Supplies

METALS—Continued

Manganese nickel hot rolled rods "E"—low manganese (base) 54.00
Manganese nickel hot rolled rods "D"—high manganese (base) 57.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00@10.75	10.00	9.50@10.00
Copper, heavy, and wire	9.62½@10.50	9.75	9.50@10.00
Copper, light, and bottoms	8.50@9.00	8.25	8.00@8.25
Lead, heavy	5.62½@6.00	5.00	5.00@5.50
Lead, tea	4.37½@5.00	3.00	3.00@3.25
Brass, heavy, yellow	6.50	8.50	6.00
Brass, heavy, red	8.50@8.75	5.00	7.50
Brass, light	5.75	5.50	5.00
No. 1 yellow brass turnings	6.50@6.75	3.50	6.00
Zinc	3.50@3.75	.....	2.50

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	19.00	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	13.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.75	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.20	$0.14
Cotton waste, colored, per lb.	.09@.12½	.17	.10½
Wiping cloths, 13½x13½, per lb	11.25*	36.00 per M	.16
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.03	1.09	1.05
Lard cutting oil, 25% lard, per gal.	.55	.50	79†
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.214
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber transmission:			
First grade	50%	50–10%	40–10%
Second grade	50–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	.....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.00@3.25
Coke, prompt foundry, Connellsville	per net ton		4.25@4.75
White lead, dry or in oil	100 lb. kegs		New York, 14.50
Red lead, dry	100 lb. kegs		New York, 14.50
Red lead, in oil	100 lb. kegs		New York, 16.00

*White, at washery.
†Chicago quotes on pure lard oil, No. 1 grade.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0334	$0.0349	$0.0354
Cold finished shafting	per lb.	0.0425	0.044	0.044
Brass rods	per lb	0.14	0.145	0.18
Solder (½ and ½)	per lb.	0.3375	0.335	0.285
Cotton waste	per lb.	.14@.21	.14@.21	.10@.13
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	0.55	0.55	0.55
Machine oil	per gal.	0.29	0.29	0.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	50%	50%	30%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	50%	60–10–5%	60%
1½ and 1½x3 in. up to 12 in	15%	60%	60%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	40%	$3.50 net	60%
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	3.50 net	60%
Button head bolts, with hex. nuts	10%	List net	.....
Hex. head and hex. nut bolts	10%	.....	.....
Lag screws, coach screws	50%	.....	65%
Square and hex. head cap screws	75%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	40%	60%	55%
Bolt ends, with hot pressed nuts	50%	.....	60%
Tap bolts, hex. head, list plus	35%	.....	$4.65
Semi-finished nuts, ⅞ and smaller	70%	.....	.....
Semi-finished nuts, ¾ and larger	65%	70%	.....
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.75
Washers, cast iron, ¾ in., per 100 lb. (net)	5.50	4.00	3.75
Washers, round plate, per 100 lb. Off list	1.50	4.50	4.50
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	4.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	4.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	4.00	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	50%	60–10%	70%
Rivets, tinned	50%	60–10%	70%
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.50	$3.50
Cone heads, ditto (net)	5.20	3.60	3.70
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
¾ in. diameter *EXTRA*	0.35	.....	0.15
⅞ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$4.20 bas

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

D. C., Washington—Southern R.R. Co., Southern Bldg., C. R. Craig, Genl. Purch. Agt.—24 in. heavy-duty lathe.

Ky., Louisville—Office of United States Engineer, P. O. Box 72, one 6 x 6 in. belt driven power hack saw.

Ill., Chicago—Illinois Central Railroad Co., J. J. Bennett, Purch. Agt., 35 East 11th Pl.—bolt cutting machine.

Ill., Warsaw—Ozonized Ox Marrow Co.—shaper 15 to 20 in., butt welder 11 to 4 in. capacity, wire machine to make spiral wire handles and coiled springs, 18 in. high-duty engine lathe. (used).

Mass., Worcester—Worcester Pattern & Model Co., 93 Harding St.—four sided wood moulding machine.

Mo., St. Louis—William-Epstein Chevrolet Co., 5929 Easton Ave.—arbor press. (new or used).

N. J., Jersey City—A. Stone, 301 Ocean Ave.—one overhead trolley, 3 ton capacity.

O., Columbus—Columbus Bolt Works Co.—mechanical equipment for new factories.

Pa., Johnstown—Bethlehem Steel Co., overhead electric cranes, four 10 ton, 106 ft. 6 in. span. Six, 10 ton, 97 ft. 6 in. span. Two, 10 ton, 56 ft. 6 in. span. Two, 10 ton, 81 ft. 6 in. span. One, 10 ton, 66 ft. 6 in. span. One, 20 ton, 36 ft. 6 in. span.

Pa., Meadville—Hookless Fastener Co.—milling machines, drill presses, annealing furnaces.

Pa., Pittsburgh—Alleghany County, J. P. Moore, Compt., 519 Southfield St.—two locomotive cranes.

Pa., Pittsburgh—Universal Portland Cement Co., Carnegie Bldg., C. Miller, Jr., Purch. Agt.—18 to 20 machine tools including lathes, drills, etc.

Pa., Pittsburgh—Rosedale Foundry & Machine Co., Columbus and Preble Aves.—6 ft. radial drill, keyseater 16 in stroke, 2 in. width capacity, power hammer 2¼ in. square capacity.

Wis., La Crosse—Vaughn Products Co., c/o J. O. Weisse, California & Gilbert Sts.—woodworking machinery, planer and power saws.

Wis., Ladysmith—W. D. Morgan—loading crane, and 36 ft. x 24 in. belt conveyor.

Wis., Lancaster — Brackett Machinery Co.—drill presses, grinder.

Wis., Milwaukee—Bd. of Industrial Education, 7th and Prairie Sts.—additional shop equipment and tools for 3rd unit of Continuation School.

Wis., Milwaukee—A. A. Hintz Hardware Co., 1187 Burnham St.—sheet metal working machinery.

Wis., Wausau—H. A. Bauman, 109 4th St.—tool lathe, drill.

B. C., False Creek—J. Hanbury & Co.—band saws, rip and edging saws, planers, etc.

Ont., Clarence Creek—H. Beauchamp—equipment for saw mill.

Ont., Dalkeith—E. A. Ethier—complete machinery for saw mill.

Ont., Toronto — Kingston Shipbuilding Co., Ltd., W. S. Morlock, Director—complete equipment for new shipbuilding company.

Ont., Toronto—The Washington Engineering Co., Ltd.—equipment for pump manufacturing.

Que., Bourget—P. Hurtulise—equipment for blacksmith shop.

Que., Buckingham—T. Dawphourse—additional machinery for sash and door manufacture.

Que., Buckingham—A. Lavigne—equipment for garage repair shop.

Que., Buckingham — Royal Machine Works, Joseph St.—machine shop equipment.

Que., Harrington—L. Marshall—band saw and rip saw.

Que., Lachute—J. A. Anderson—drill press, lathe, etc.

Que., Lachute—L. W. Hammond—additional equipment for saw and grist mill.

Que., St. Agathe—J. Lamoureux, Principale St.—equipment for garage repair shop.

Que., St. Agathe des Monts—M. Parquette—lathe, emery grinder and repair tools.

Que., St. Agathe des Monts—J. A. Pave—sticker, jointer, etc.

Que., St. Isidore—C. Bazinet—post drill, stand, etc., for heavy duty.

Que., St. Jerome—A. A. Viau—drill, emery grinder and stand.

Que., St. Michel—P. Lemoyne—drill and equipment for blacksmith shop.

Que., St. Remi—A. Vary—equipment for garage and repair shop, grinder, bench, lathe, etc.

Que., Shawbridge—I. Strong—pedestal grinder, drill, etc.

Australia, Melbourne — Department of Railways, will receive bids until Aug. 27 for one 7 ton electric traveling crane, complete with double controller, various machines, including bolt, screwing, nut tapping, grinding, punch and metal sawing including tools and accessories, power hammer and shears.

Opportunities for Future Business

California — California Wire Co., 204 North Cypress Ave., Orange, plans to build factory for manufacture of insulated wire and cables, site not selected. Estimated cost $100,000.

Calif., Los Angeles—G. M. Duntley, c/o Jefferey & Schafer, Kerchkoff Bldg., Archts., is having plans prepared for the construction of a 1 story, 125 x 150 ft. garage on San Pedro Street.

Calif., Modesto—Borden Condensed Milk Products Co., Kansas Ave., is having plans prepared for the construction of a 1 story, 50 x 180 ft. can factory here. Estimated cost $100,000. Davis-Heller-Pearce Co., Dalta Bldg., Stockton, Archs.

Calif., Redwood City — Dessin Bros., Main & Donnelly Sts., Burlingame, plans to build auto sales rooms, stores and machine shop here.

Calif., San Francisco—Buck Bros. Welding Co., 1503 Folsom St., will build a 1 story welding shop by day labor. Estimated cost $6,000.

Calif., San Francisco — Jewell Steel & Malleable Co., 1315 Potrero Ave., awarded the contract for the construction of a 1 story addition to plant. Cost about $8,500.

Calif., San Francisco—L. R. Lurie, 315 Montgomery St., awarded the contract for the construction of a 2 story factory on Harrison Ave. Cost $45,000. Noted July 17.

Conn., Waterbury—Waterbury Buckle Co., 872 South Main St., awarded the contract for the construction of a 5 story, 60 x 85 ft. factory. Estimated cost $40,000.

Conn., South Windham—Smith & Winchester Mfg. Co. awarded the contract for the construction of extension to foundry. Estimated cost $60,000. Private plans.

Ky., Corbin—Louisville & Nashville R.R. Co., 10th St. & Broadway, Louisville, awarded the contract for the construction of a machine and forge shop, here. Estimated cost $40,000. Noted July 24.

Md., Baltimore—Star Motor Car Co., c/o J. Nechankin, 816 East Fayette St., is having plans prepared for the construction of a 2 story, 30 x 156 ft. factory. Estimated cost $50,000. S. Russell, 11 East Lexington St., Archt.

Mass., Charlestown (Boston P. O.)—Wright & Ziegler Co., manufacturers of dairy apparatus and supplies, 12 South Market St., Boston, is having plans prepared for additions to factory on Spice St., here. Monks & Johnson, 99 Chauncey St., Boston, Archts.

Mass., East Walpole—Bird & Sons, is having plans prepared for the construction of a 1 and 2 story, 65 x 450 ft. store house and box shop. Estimated cost $200,000. Monks & Johnson, 99 Chauncey St., Boston, Archts.

Mex., Monterey—The Ford Motor Co., Detroit, plans to build a 2 story factory here. Estimated cost $2,000,000.

N. Y., Alden—A. Y. Bennett Mfg. Co., manufacturers of steel filing cabinets, plans to rebuild factory recently destroyed by fire.

N. Y., Binghamton — The Delaware Lackawanna & Western Railroad Co. has awarded the contract for the construction of round house, power house and miscellaneous buildings. This is a part of the Conklin Ave., yard. Estimated cost $2,250,000.

O., Athens — State of Ohio University, Columbus, is receiving bids for the construction of a 4 story, 110 x 116 ft. manual training building, here. Estimated cost $300,000. H. D. Briggs, Columbus, Archt.

O., Chagrin Falls — R. Harrington awarded the contract for the construction of a 2 story, 80 x 200 ft. garage. Estimated cost $150,000. C. C. and A. E. Weber, Ingalls Bldg., Cleveland, Archts.

O., Cleveland — Bishop Products Co., manufacturers of automobile accessories, G. E. Bishop, Pres., 7512 Carnegie Ave., had plans prepared for the construction of a factory. H. Swigert, 18210 Olympia Rd., Archt.

Okla., Shawnee—Chicago Rock Island & Pacific Railway Co., LaSalle St., Chicago, Ill. C. A. Morse, Chf. Engr., plans to rebuild shops here, destroyed by fire. Estimated cost $600,000.

Pa., Pittsburgh—Foos-Hughs Co., 21st and Market Sts., plans to build a 2 story sales and service building on Allegheny Ave. Architect not selected.

Pa., Pittsburgh — Wayne Iron Works, Commercial Bldg., awarded the contract for the construction of a 1 story, 174 x 49 ft. factory.

Tenn., Chattanooga—Ross-Meehan Foundry Co. awarded the contract for the construction of an addition to foundry on Carter St. Estimated cost $50,000.

Tex., Houston—Linde Air Products Co., Holly & Harrisburg Sts., plans to build a factory. Estimated cost $100,000.

Tex., Houston — The Prest-O-Lite Co. Inc., 30 East 42nd St., New York, plans to build factory to consist of 10 buildings for the manufacture of storage batteries and similar products. Estimated cost $500,000.

Tex., Houston—The Southern Pacific R.R. Co., Southern Pacific Bldg., awarded the contract for the construction of car repair shops, mill building and lumber sheds at Englewood Yards. Cost approximately $500,000. Noted May 29.

Tex., Woodville—Guarantee State Bank—plans addition to saw mill. Estimated cost $45,000.

B. C., False Creek—J. Hanbury & Co., plan to build saw mill and drykiln, estimated cost $300,000.